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# Electrical World

*The consolidation of Electrical World, Electrical Engineer and American Electrician*

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## *N.E.L.A. Convention Report*

JUNE 9 ISSUE OF ELECTRICAL WORLD

VALUABLE information for all electrical men will be disseminated at the N.E.L.A. convention at Atlantic City next week. More than ten thousand utility men will meet and discuss their affairs, and men of national reputation will talk about the electrical industry.

The editorial staff of ELECTRICAL WORLD will report this convention in complete detail in the issue of June 9. The convention does not close until Friday, yet on Saturday the ELECTRICAL WORLD will be in the mails. Only a big staff and a large and efficient publishing house could render such a quick and complete service. All electrical men cannot be at the meeting, but all may rely upon a detailed account of the proceedings in our June 9 issue.

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# Electrical World

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JAMES H. MCGRAW, *President*
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W. H. ONKEN, JR.
*Editor*

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## *How Can Utility Companies Help Stabilize State Commissions?*

GENERAL satisfaction with regulation, and more especially with the personnel of the public service commissions, is perhaps too much to expect. Yet something should be done to offset the political moves made just before state political conventions to dispense with the commissions. Until greater faith is shown in the commissions by the general public it must be expected that the commissions will have a political rather than a judicial and economic aspect. This does not augur well for stability or steadfastness of purpose, does not assure the public of righteous judgment in disputes, and means continued inroads on the time of utility executives that ought to be devoted to the business itself.

We realize, of course, that any attempt at co-operation between the utilities and the commissions would be misinterpreted to the detriment of the commissions. However, if the utilities will obviate as much as possible any cause of complaint, there would be little occasion for the public or the politician to harass the commissions. The less of law or supervision business has, the better for business and the greater its opportunity to render satisfactory service. Therefore the utilities should make regulation successful by not meriting much of it. Then the life of commissioners would be more pleasant and their relations with the public more agreeable and satisfying.

* * * *

## *An Official Viewpoint That Should Be General*

COMMENTING upon reported showings of twenty-three California cities operating municipally owned light and power systems, State Controller Riley made the following very pertinent statement: "The accounting system of municipally owned public service enterprises is of a character that prevents the controller from giving adequate information covering their operation. It is impossible to ascertain whether there is a loss or a gain, as the statements furnished are in the main 'flow of cash.' Each year shows a tendency on the part of municipalities in this direction, and the Legislature should require proper accounting methods for the protection of the taxpaying public. Governmental agencies might well set an example by the adoption of sound accounting methods and thereby definitely dispose of the controversy regarding costs that now exist as between publicly and privately owned utilities."

We have contended that all public utility service, no matter by whom rendered, should be subject to regulation as to rates and quality of service. In some states, notably Wisconsin, such regulation obtains; but in most of the states the municipalities have been successful in their efforts to keep their affairs free from state scrutiny. That is the reason so little is known of municipal operations and why so much that may not be so is spread broadcast by municipal ownership zealots. When more state officials and legislatures show a disposition to ferret out the truth, as has the State Controller of California, for example, the real facts on municipal ownership will become known.

* * * *

## *Cheer from Battle Creek*

AMONG the very many men who see a brilliant future for the electrical industry, none is more optimistic and none more qualified to speak from experience than Henry L. Doherty. At a time when men are asking, "What of the future? Who will carry on when the pioneers drop out?" there comes a refreshing and inspiring message from Battle Creek. There, watching as it were from the side lines while gradually recovering from a rheumatic ailment, Mr. Doherty sees "nothing but expansion and still further expansion ahead."

Mr. Doherty's message to the ELECTRICAL WORLD, printed in our news columns this week, reflects the sane optimism and the well-based confidence of a man who has lived with and for the industry through the generation in which it has made industrial history. Through his prophecy sounds, not the note of doubt that could easily be pardoned to a leader temporarily inactive because of ill health, but a ringing challenge to all doubters from a leader longing to be back on the field. When he feels this way, it is no wonder that other leaders in full strength and vigor echo his enthusiasm.

* * * *

## *Congress Investigates Superpower Finance*

INVESTIGATORS will find that some one has made money out of central-station tie-ups. By far the most guilty culprit will be found to be the American power consumer, who is getting electrical energy at steadily decreasing cost. Intelligent elimination of waste and unnecessary human labor always produces large profits. In the case of electric power, enormous savings have been made by group operation of properties and the installation of the most efficient generating equipment. Wealth has been created by conservation rather than by extortion.

If a few hundred men of courage and energy have made fortunes for themselves by making these savings for the consumer of electricity, it will not be held against them. The fortunes are more respectable than many which were founded before the day of the great central-station companies. It is not a crime in the United States of America to get rich selling people what they need at rapidly decreasing prices.

## *Low-Voltage Neon Tubes*

DEVELOPMENT of the hot cathode has made possible the use of low-voltage neon tubes. One of these tubes, recently described by C. G. Found and J. D. Forney before the American Institute of Electrical Engineers, gives an output of 10,000 lumens. This tube was rated at 220 volts and was 2.2 cm. in diameter and 125 cm. long. Measurements of the over-all efficiency of direct-current tubes give 12 to 15 lumens per watt and of alternating-current tubes give 10 to 12 lumens per watt. These efficiencies compare favorably with those of 100-watt tungsten-filament lamps.

Further developments in glow-discharge lamps may be expected now that the cathode drop has been reduced. Investigations of color emanations from various gases and of better methods for starting tubes offer attractive possibilities. The voltage necessary to ionize a gas is never greater than 25, and from the point of view both of efficiency and of luminosity prospects are good for a great commercial development in glow lighting.

* * * *

## *Aspects of the Problem of Radio Interference*

PUBLIC relations and residential service expansion are closely associated with the use of radio in the home. This justifies individual and concerted attack by power companies upon the problem of radio interference. The outlook for further progress is encouraging, and the technique of suppression has advanced to the point where perhaps 50 per cent of the legitimate complaints can be met without the drastic step of replacing the apparatus unit (be it wire or device) diagnosed by the skilled maintainer as the seat of trouble. The manufacturer of radio sets and accessories is likely to come into the picture as a more active influence toward the improvement of reception conditions, and recent advances in the design of insulators, power noise traps and voltage regulators look very promising.

The precision of voltage control feasible at the household outlet in central-station service without the investment of considerable totals in newly designed devices is far below the requirements of some of the latest alternating-current tube sets. It has been suggested that the incorporation of such devices into the assemblies of high-grade receiving sets may well be considered by the radio manufacturer as a betterment, the cost of which should be absorbed by the selling price without adding unduly to the purchaser's outlay. The manufacturers of heavy-duty electrical equipment for home service, like automatic-control push-button elevators and grouped refrigerators for apartment-house use, are also confronted by the possibility of being asked to provide in their future designs for the inclusion of suppressive devices by whose use the high-grade sets within reach of occupants of such buildings can in many cases be made to render far better service, especially in installations operated by direct-current motors.

In the long run, there is no need to say, the consumer of high-grade service must pay its cost, and if purchasers of space radio sets continue to demand extreme sensitivity in distance reception and minimum interference from local or territorial disturbances, the industry will have to co-operate still more effectively in working toward these objectives. Progress in the elimination of line disturbances has now attained a high degree of success, and the power companies are liberally meeting this cost. The allocation of the cost of preventive measures internal to household service devices remains to be considered and applied along the lines of a standard industry procedure, so to speak. The spread of radio network broadcasting and outlook for wired-wireless service over local distribution systems bid fair to contribute toward the solution of many problems in interference through a growing popular appreciation of the superior quality of reception attainable in this way.

* * * *

## *Census Data Needed*

THE electrical industry, like any other element of American business, believes in statistics and has come to rely upon the government's census data as authoritative. Census figures on operations of the electrical industry constitute an essential part of that pool of information to which not only all Americans but indeed all civilized men in whatever country contribute and on which they are in turn able to draw. We all profit from it—directly in business, indirectly in the general advancement that flows from a greater fund of facts.

In the light of these things it comes as a surprise to learn that only 50 per cent of the returns have thus far been received by the Bureau of the Census for the electric light and power census of 1927 as against nearly 75 per cent for the biennial census of manufacturers, though both canvasses began in January.

True, the electrical schedule is complex; to fill it out entails a great deal of work especially on the part of companies responsible for returns on many individual properties. But there is a strong probability that the laggards are not those on whom the heaviest burden falls. The bureau cannot proceed with its tabulation until all returns are in. Every delay in reporting delays the publication of the result. It is not good business to wait until 1929 for 1927 statistics, and it is to be hoped that responses will be made promptly to the Census Bureau.

* * * *

## *Does the Contractor Need Relief or Reform?*

IN A WAY the electrical contractor seems to be in about the same position today as the American farmer. He is demanding relief, but what he really needs is reform. Business has been bad with him. He has been working hard and doing good work, but he has not made money. He is economically sick. That makes him unhappy, which naturally warps his judgment. He is sorry for himself. He maintains that something should be done about it, but he does not recognize and assume his inescapable responsibility to do this "something" for himself.

In vetoing the McNary-Haugen bill President Coolidge pointed out in vigorous terms that what the farmer needs is not the crutch of subsidy and price fixing but the courage to face the economic facts of his business and reform his methods of marketing. The same answer could well be recast for the contractor. It is his own business methods that have led him into grief. The power company or the jobber or the manufacturer may be able to improve some of the conditions that embarrass him, but nothing that they can do will correct his own bad practices. This he must accomplish for himself.

The contractor is extremely important to the electrical

industry right now, for the vital need is for more adequate wiring installations to provide for more complete equipment in home, store, office and factory. But there are too many contractors and they are fighting for business by destructive price competition. To get the price low they keep the job small, and this restricts the whole market for electrical energy and products. They do this not because they want to, but because the large number of wiremen working "on their own" with no thought of overhead has forced the business to a condition of "squeeze-price" paralysis.

In considering what should be done two points stand out. First, the American people are willing to pay a fair price for wiring. Whatever adequate wiring is worth it will bring. It need not be given away; it needs to be sold. Second, the contractor himself must put his trade in order and lift it to a prosperous economic plane. The chief trouble with the contractor is that he provides himself with no margin to cover development and sales expense. Sooner or later he must face that natural necessity. He must add something, say, to the labor charge on every job to provide funds with which to build up a public appreciation of the importance and value of adequate wiring and to establish his own reputation for work of high quality. In this way the contractors of the community might well set up in the league a co-operative fund for use in raising the local standards of the wiring business. It is futile to hope that such a situation will right itself. The contractor will have to reform his own business.

* * * *

## *Free Speech and the Point of View*

FREE speech is a text in the gospel of democracy, but the interpretation of this text depends upon the point of view. It seems to have become a special privilege for a few favored idealistic college professors, radical literary writers, yellow newspaper editors, day-dreaming pacifists, fanatical reformers and country-saving politicians. The free-speech privilege claimed by all these cults imparts a note of humor to an otherwise drab existence and introduces just sufficient vitriol to burnish the products of those who are carrying on constructive activities.

Free speech should also be granted to American business. Yet some recent happenings in this country and especially the utility investigation in Washington introduce the doctrine that business must remain mute at all times; that it must make no effort to protect the interests of its security holders or of the customers that rely upon its service even when attacks are made upon it. Privately owned and operated business should not be muzzled. It should be able to address, educate or persuade the public, and it should be wise enough to do this by using facts. Alleged exposures of bad practices and improper activities by corporation lobbies and publicity agents should not be made the reason for a doctrine that denies free speech to business. Yet this is what many politicians, editors and publicists seem to desire, according to comments and actions in recent days. The free-speech cult can send out pamphlets, maintain lobbies, write editorials and publish distorted statements with immunity, but the business it attacks must be silent.

The great national game of a certain group of citizens is to investigate private business. The specialists in free speech refuse to investigate or attack any anti-capitalistic, labor, social, municipal or governmental business enterprise, but hover like vultures above private corporations only. Unless business can and does speak, there is evidence that a revival of professional muckraking will occur, for already war has been declared against publicity about business, against economic education, against addresses by business men and against every legitimate tool of free speech that does not conform to opinions of the self-constituted "free-speech" cult which dwells as a parasite on the makers of national prosperity. Business should use its privilege of free speech now, because the "tearers down" believe their day has dawned again.

* * * *

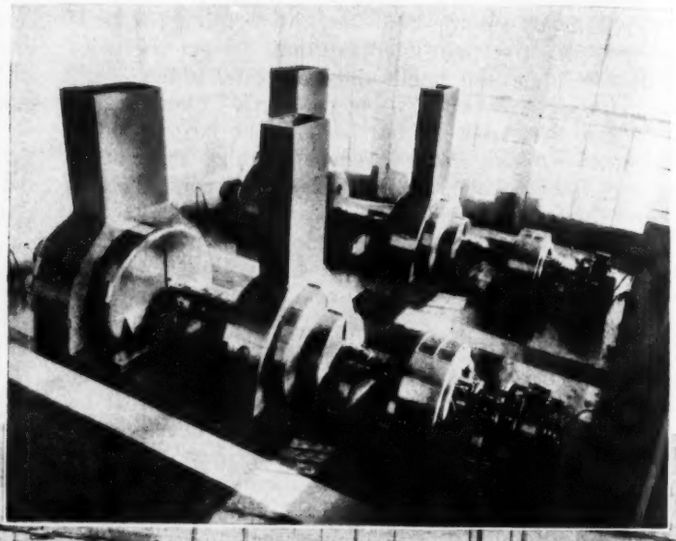
## *Technique of Interconnection Is Improving*

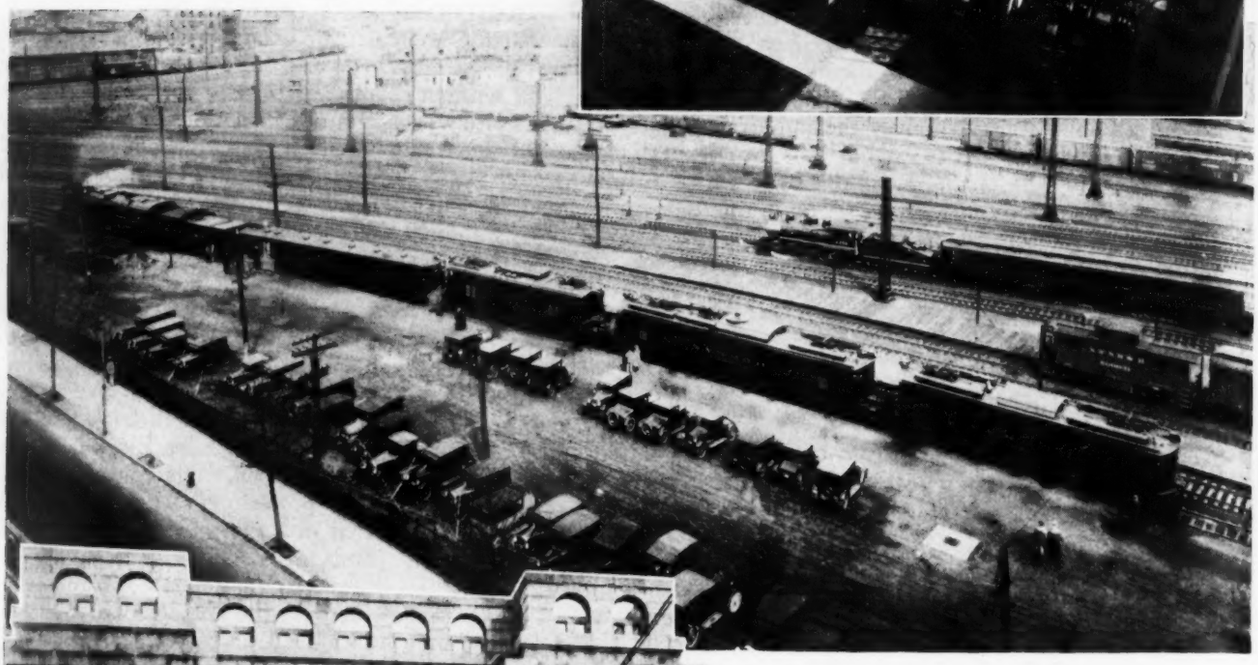
GRATIFYING gains in the handling of interconnected systems are apparent to those privileged to go behind the scenes at important operating centers and to hear engineers and load dispatchers discuss their problems without thought of publication. Great improvement has lately been attained in the maintenance of first-class frequency regulation on systems made up of hydro and steam plants serving extensive regions often involving several states. Load control is also making better headway, although the problem of forecasting the effect of load transfers between neighboring companies has not as yet been reduced to a simple one in relation to either local or distant networks of plants and transmission lines. Perhaps it would be fair to put it down that the more carefully operated interconnections are constantly attaining and holding to standards of service above the requirements of their customers and that many such systems are, for the time being at least, more concerned with the economic aspects of load transfer than with the solution of the frequency problem *per se*.

Experience shows that in a typical interconnection including generating plants of 1,500,000 kilowatts rating and embracing several thousand miles of transmission lines it is now possible to keep the frequency of the whole region within one-twentieth of a cycle at all times when the conditions warrant. This can be done by either hand or automatic regulation. It is at times necessary to disturb the scheduled distribution of load. Excellent automatic regulation is apparently to be counted upon in this system, even though the regulating hydro station represents only a small percentage of the combined plant kilowatts. The close regulation attained is extremely desirable for the proper distribution of loads over the various ties and, of course, to keep down large undesirable transfers between companies. With systems spread out over territories of increasing size and with so many independent companies interconnected as is often the case, more or less reaction is bound to occur at different points when trouble arises in any section. It appears on some system log sheets that thus far the transfer of load from steam to hydro plants in cases of outages on particular sections has caused the most widespread tripping of circuit breakers, but that automatic regulation indicates possibilities of improvement along the line indicated.

Plenty of troubles can be unearthed at the price of a little skillful digging, and some engineers are lukewarm advocates of tie-in operation except in emergencies; but the amount of engineering thought now being devoted to realizing the economic potentialities of interconnection justifies a liberal degree of optimism.

# *Purchased Power Serves Railroad Trunk Line*





APPROXIMATELY one-third of the 200,000,000 kw.-hr. annually required for operation on the New York, New Haven & Hartford electric trains is purchased from central-station companies. This energy is supplied at several points in addition to those receiving power from the road's own station at Cos Cob, Conn. One of the latest "points of contact" between the railroad and venders of power is the 10,000-kw. variable-ratio frequency-changer installastion at Devon, Conn.

Top—Variable-ratio frequency changers at Devon, Conn.

Center—Various types of N.Y., N.H.&H. electric motive power on exhibition.

Bottom — Boston-Washington "Colonial Express" on Hell Gate Bridge.

# Selling Power to Railroads

**Liberal treatment of demand conditions essential. Examples of recent contracts for supplying heavy service to trunk lines, including the Wilmington division of the Pennsylvania Railroad**

THE stage is set for negotiations of far-reaching importance between power companies and railroads in connection with the supply of energy to electrified sections of lines hitherto served by steam locomotives. Transportation men are asking the power companies to "meet them half way" in regard to terms of contracts covering this class of service, and while the advance of railroad electrification is gradual, for reasons beyond the control of its most active advocates, the railroads are looking more favorably upon the policy of buying power than ever before. At the recent regional convention of the A.I.E.E. in New Haven a session devoted to electrification problems emphasized various aspects of selling power to railroads which should not be overlooked by executives and commercial departments of power companies in territories where this class of business is either being handled today or is in prospect for the near future.

### Illinois Central Practice

In a paper on "The Chicago Terminal Electrification of the Illinois Central Railroad" R. F. Schuchardt, electrical engineer of the Commonwealth Edison Company, and W. M. Vandersluis, electrical engineer of the railroad, pointed out that the power contract* which was entered into in 1924 and under which operations began in May, 1926, calls for the delivery of energy from the substations of the power company at 1,500 volts direct current for traction and 2,300 volts alternating current for signaling. Three-phase energy at 4,000 volts is also provided for light and power service in the stations and shops. The charges for electricity follow the proved Hopkinson method with a "primary" in recognition of the power company's investment and a step rate "secondary" to cover the operating and service costs. To take account of variations in coal cost there is a provision for a change in secondary charges if the cost and heat content of the coal used fall outside certain limits.

The primary charge is based on the maximum amount of energy drawn under normal operating conditions. In order that the railroad company may have the advantage of the power company's large reservoir of energy and without the payment of the regular primary charge for additions required in emergencies only, abnormal demands due to such emergencies are excluded in determining the maximum demand for billing. The recognized emergencies are: (1) Abnormally heavy traffic resulting from failure of other transportation lines, unless continuing for more than ten consecutive days; (2) traffic arising from extraordinary assemblages, such as fairs, race meets, ball games, conventions, etc., unless continuing for more than ten consecutive days; (3) congestion of traffic arising from a railroad accident, derangement of power supply or other emergency conditions; (4) other excessive traffic beyond that usually carried and caused by some unusual circumstance or condition; (5) hours during which the temperature is plus 5 deg. F. or lower (the suburban cars are all electrically heated).

The limit to which electricity may be drawn under these emergencies is the capacity of the power company's equipment which may be usable for railroad service during such emergencies. This is one of the features of the contract which makes central-station service of so much greater advantage to the railroad than would be that from its own separate plant, the authors state. To insure a reasonable, continuing return on the investment made by the power company the railroad guarantees that the maximum demand that it will pay for in any month will be not less than 70 per cent of the highest demand established during the last preceding twelve months. A minimum monthly load factor of 30 per cent is also guaranteed.

One of the railroad's requirements which was finally accepted by the power company, but with some misgivings, relates to regulation of the feeder pressure. The high-speed suburban service with short intervals between trains requires a close adherence to running schedule, and this, in turn, was felt to demand close voltage regulation. The permitted variation is from 1,400 to 1,500 volts on the feeders at the point of delivery on the railroad right-of-way, which is practically at the substation.

Provision is included for additional capacity in new or existing substations as the increase in load requires. The power company may install additional equipment in its substations for uses other than this electrified railroad, and also use its equipment to serve other electrifications.

### Purchased Power Adds Reliability

Sidney Withington, electrical engineer New York, New Haven & Hartford Railroad, declared that by purchasing a considerable portion of its power the company's service in the electrified zone between New Haven and New York has been made more reliable, and this has justified the extra expense in comparison with further enlarging the Cos Cob plant. He pointed out that as a rule a railroad can purchase coal on more favorable terms than power companies and that it can hire capital at lower rates. Transportation companies, he said, should not be penalized in power contracts because of emergency conditions beyond their control. G. I. Wright, engineer of electric traction Reading Railroad, stated that the power companies hardly realize what the railroads are facing in trying to handle suburban service economically and maintained that the load-factor problem and the possibilities of off-peak business should be considered.

Henry Craig Sutton, electrical engineer United Gas Improvement Company, Philadelphia, pointed out that trunk line electrification improves load-factor conditions on the power system, as the peak load of the railroad

*For details see Electrical World, *Jan. 10, 1925.*

traffic may easily occur in the middle of the night. The isolated generating plant of the railroad rapidly grows out of date, whereas the modern power system keeps its generating facilities in line with the latest progress, expanding plants and bringing down the cost of power by continually making new and better installations.

E. R. Hill of Gibbs & Hill, consulting engineers, New York, said that probably the most unusual feature of the Illinois Central power contract is the supply by the power company of converted current at the seven substations located along the railroad. It is most usual for the power company to supply alternating current at a single point and for the railroad to transmit and convert or transform this power itself. "The Schuchardt-Vandersluis paper," said Mr. Hill, "calls attention to a practice which has now become quite general and which is required as absolutely necessary in railroad electrification work, i.e., for the power company to supply excess demand in railroad emergencies without affecting the demand charge. In other words, the demand charge is determined by the railroad's power requirements under normal conditions and emergency drafts of power do not affect the demand billing. This is very important and really essential in railroad operation because of the fact that abnormal and emergency conditions occur much more frequently in railroad operation than in probably any other industry, and it is impossible for the railroad to control or prevent the occurrence of such exceptional demands.

### Most Recent Electrification Contract

"The most recent large power contract for railroad electrification that I have knowledge of was negotiated and consummated last year between the Pennsylvania Railroad and the Philadelphia Electric Company at Philadelphia. This is a continuation of an earlier contract covering the supply for the Pennsylvania Railroad's suburban service in Philadelphia, intended to provide for all traction requirements in that territory, including through electrification connecting New York, Washington and elsewhere if and when carried out, for a period of twenty years.

"The power company contracts to supply the power at 25 cycles, single phase, 13.2 kv. at certain main supply points in the vicinity of Philadelphia or elsewhere as may be arranged from time to time. The railroad steps up the voltage to 132 kv. and transmits at this pressure to its various transformer stations along the line.

"The outstanding feature of this power agreement is that the charges or rates are based on the actual cost to the power company of producing power in its generating stations, transmitting and converting it at the supply points. This actual cost includes fixed charges, general expenses and all other items properly entering into the total cost. In order that the railroad may be protected against any unforeseen high cost of producing power, the power company guarantees that the demand charges and the energy charge shall not exceed certain stipulated values that were estimated and set up at the time of the negotiations. Such guarantees are based on specific costs of coal and labor. Maximum rates for fixed charges are also stipulated. Some other features of the contract are: (a) Demand determined monthly based on three maximum normal clock hours per month; (b) demand may not be less than 75 per cent of any previous maximum demand; (c) guaranteed monthly load factor, 30 per cent; (d) guaranteed power factor, 55 per cent; (e) if lower rates are subsequently made to other consumers under similar conditions of supply the railroad shall be entitled to the same rates.

"At a load factor of 55.5 per cent, a coal cost of $5 per net ton, present labor rates and guaranteed maximum demand and energy costs the average cost of energy to the railroad at the supply point or points under this contract works out at 0.75 cents per kilowatt-hour."

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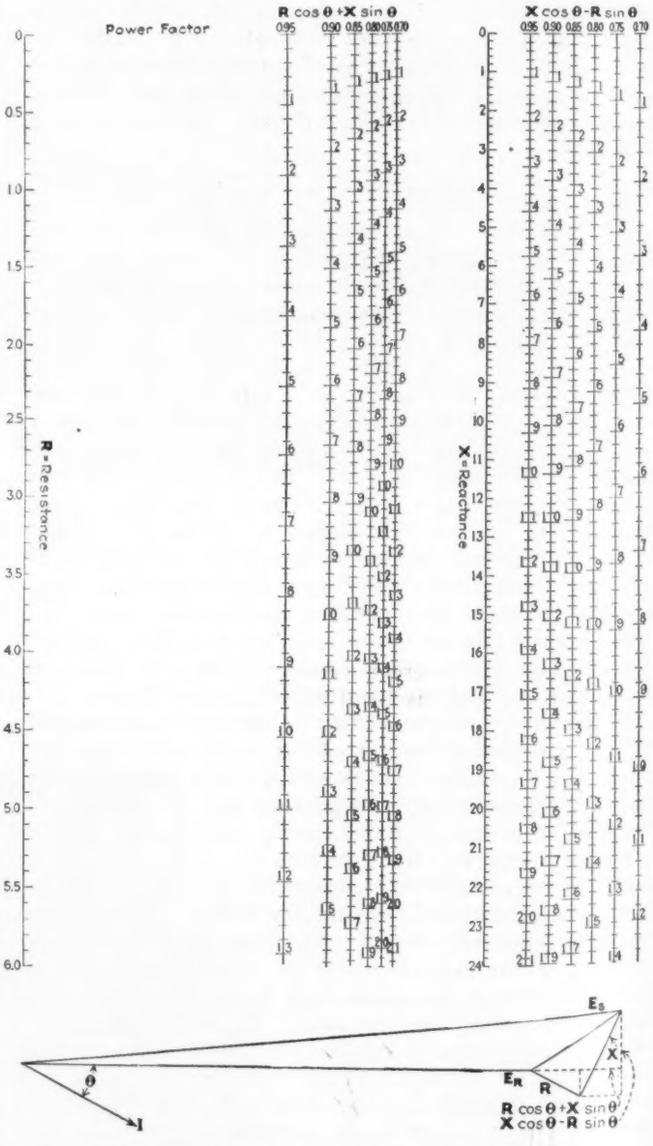
## Rough Check for Voltage-Drop Components

By Raymond C. R. Schulze
*Public Service Electric & Gas Company*

THE accompanying chart provides a quick way to determine roughly the in-phase and quadrature components of the voltage drop along a transmission line. The chart actually gives the voltage drop per ampere for known values of resistance, inductive reactance and power factor, or $R \cos \theta + X \sin \theta$ and $X \cos \theta - R \sin \theta$. The first is, of course, the component of the




*Voltage-drop chart and vector components to which it applies*

voltage drop in phase with the receiver voltage, while the second is the component of the voltage drop 90 deg. out of phase, or in quadrature, with the receiver voltage. This relationship is easily seen by referring to the vector diagram given here.

In order to obtain the total drops it is necessary to multiply the values obtained from the voltage drop chart by the number of amperes flowing in the line.

## Essential Features of Interconnection Contracts*

IT IS desirable generally to frame the rate clause so that each element is dealt with individually rather than collectively and then to simplify by the omission of such elements as are not important in the specific instance under consideration. The rate structure should be built up to contain the following elements or provisions:

1. A fixed charge for capacity reserved exclusively for the use of any one party.
2. An energy charge covering energy capacity. This may be a flat rate or a step rate, or may be modified by special rates for dump power or for off-peak power.
3. A power-factor clause.
4. Provision for emergency service.

Fundamentally, the demand billing of one system to another should be equivalent to the maximum requirements of the user minus the useful generating capacity of the latter, taking into consideration the physical condition and the degree of obsolescence of the generating equipment itself, together with the number, type and capacity of generating station tie-lines. This useful capacity is generally referred to as "relayed capacity" and consists of the total useful capacity available with the largest generating unit out of service, provided that all of the capacity has sufficient transmission line connections to render it available at all times. It is possible to simplify the demand billing by one party contracting with the other for a stipulated amount of capacity with no attention to the respective requirements of the two systems except that the generating company may require the purchasing company to hold its demand within the amount contracted for at such times as it is not expedient to allow the purchaser to exceed it. This sort of arrangement is flexible and simplifies the system operations and the billing to the greatest extent.

In the event of interconnection between two companies at several points it is helpful to system operation generally to base the demand billing upon the simultaneous demands at all metering points, using the algebraic sum and imposing few or no limitations upon the power to be taken at each metering point.

Energy should be sold at a price equivalent to average production cost within the limits of the average system load factor, plus the desired profit. It is often feasible to offer a step-rate as an inducement to the purchaser to increase his energy requirements. It may be possible to offer, advantageously, a dump-power rate for any energy used in excess of the basic block of energy contracted for. This so-called dump energy may be sold at "increment production cost plus a margin of profit" to the advantage of both parties concerned, provided it is understood that this supply of energy may be curtailed whenever the generating company deems it necessary or desirable. The modification of the energy rate may be introduced as a bonus or special rate for all energy used during specified hours of each day or specified periods of the year. The energy rate should in every instance incorporate a fuel cost.

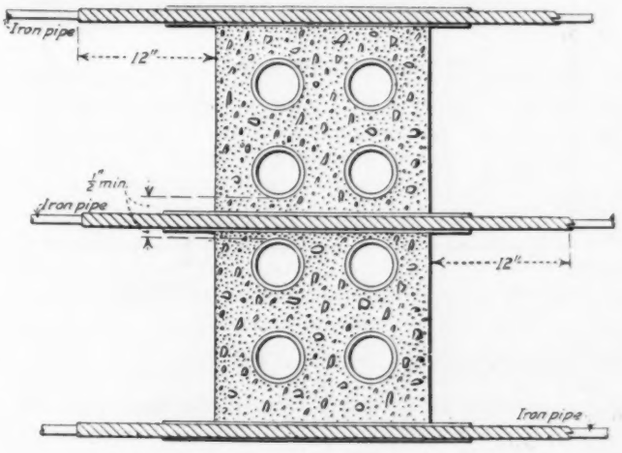
The power-factor clause is usually incorporated in order to insure legally certain limits in the proper disposition of wattless current. Each system should take care of its own wattless current. In the event that either party to the contract consistently falls below the limit, said party is requested to improve operation or provide such equipment as is necessary to permit fulfilling the conditions.

In order to insure against impairment of the quality of service and to simplify billing, it is usual to specify that emergency service will be obtained only when requested formally, either by writing or verbally, and confirmed by writing and permission to make use of the facilities formally granted. The charge for this service should be based upon energy uses only, with no reference to the demand unless the emergency requirements should extend over a considerable period, in the event of which an agreement should be worked out between the two contracting parties to cover the specific case.

*Abstract of a report by H. E. McDowell, Texas Power & Light Company, at the eighth annual convention of the Southwestern Geographical Division of the National Electric Light Association.*

## Iron Pipes Through Conduit Lines

IN THE underground system of the Kansas City Power & Light Company, in which a large amount of fiber conduit laid in concrete is used, the method here illustrated for carrying iron pipes through the duct structure is used. These pipes may be gas or water services from mains paralleling the duct line. Before the concrete is poured the pipes are wrapped with one layer of paragon impregnated tape half lapped for a distance extending 12 in. on each side of the completed duct structure. Over the paragon tape are wrapped three layers of building paper so that if the pipe is later to be removed it may be pulled out of the concrete with reasonable ease. To avoid weakening the duct structure a minimum of ½ in. is set as the clearance distance between the outside of the wrapped pipe and the nearest fiber ducts in the run. The same method applies where pipes come into contact with duct lines but do not cross them.




*Method for pipe crossings of duct lines*

# Computing Compensator Settings for Automatic Voltage Regulators

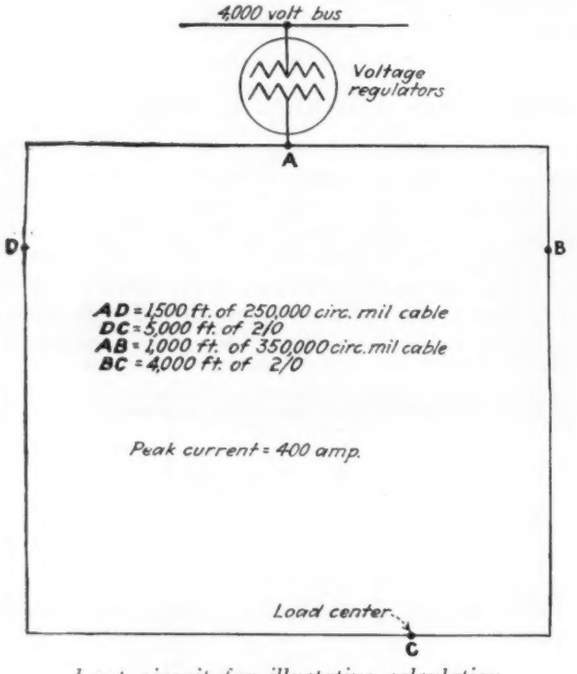
SECOND ARTICLE

By V. W. Palen

LOOP CIRCUITS.—Where there is one loop or more the first step consists in computing the resistance, reactance, and impedance values to the load center of each individual loop. For such a condition as that indicated in the accompanying figure the following procedure would obtain:

| Half of loop *ABC* | Resistance | Reactance | Impedance |
|---|---|---|---|
| (*AB*) 1,000 ft. of 350,000-circ.mil underground cable | 0.0345 | 0.0369 | 0.0508 |
| (*BC*) 4,000 ft. of 2/0 overhead wire | 0.3160 | 0.5280 | 0.6150 |
| (*ABC*) Total | 0.3505 | 0.5649 | 0.6658 |

| Half of loop *ADC* | Resistance | Reactance | Impedance |
|---|---|---|---|
| (*AD*) 1,500 ft. of 250,000-circ.mil underground cable | 0.0646 | 0.0568 | 0.0855 |
| (*DC*) 5,000 ft. of 2/0 overhead wire | 0.3950 | 0.6600 | 0.7700 |
| (*ADC*) Total | 0.4596 | 0.7168 | 0.8555 |




*Loop circuit for illustative calculation*

Combining the two halves of the loop:

$$\text{Resistance } (AC) = \frac{0.3505 \times 0.4596}{0.3505 + 0.4596} = 0.1990 \text{ ohms}$$

$$\text{Reactance } (AC) = \frac{0.5649 \times 0.7168}{0.5649 + 0.7168} = 0.310 \text{ ohms}$$

$$\text{Impedance } (AC) = \frac{0.6658 \times 0.8555}{0.6658 + 0.8555} = 0.374 \text{ ohms}$$

Since the primary current at the peak is 400 amp. and the ratio of the current transformer is usually 20 to 1:

$$\text{Resistance drop } (AC) = \frac{0.1990 \times 400}{20} = 3.98 \text{ volts}$$

$$\text{Reactance drop } (AC) = \frac{0.310 \times 400}{20} = 6.2 \text{ volts}$$

$$\text{Impedance drop } (AC) = \frac{0.374 \times 400}{20} = 7.48 \text{ volts}$$

The compensator in this case, therefore, would be set for the values $IR = 3.98$, $IX = 6.2$ and $IZ = 7.48$.

Computations for the double loop and triple loop circuits will appear in later articles.

# Operator Discusses Motor Bearing Experience

IN DISCUSSING his experience with sleeve- and ball-bearing motors in a steel fabrication plant the superintendent made the following comments to a representative of Electrical World:

"It is difficult to make recommendations or draw conclusions as to the better type of bearing—each has a definite field. We have in our shop about 63 motors (exclusive of overhead cranes), of which 54 are sleeve bearing and nine are ball bearing. The nine ball-bearing motors have been in service from one to three years and have never given any trouble. They are greased with Alemite every four months.

"We have found that sleeve-bearing motors are more or less subject to bearing and armature trouble, due to the weight of the armature wearing the bearing on the bottom side, which causes a rub on the field coils and burns out the armature. Ball bearings, on the other hand, wear evenly all around and the life of the bearing is increased considerably. In making repairs to the sleeve-bearing motors there will, of course, be interruptions, but it is difficult to state just how much loss of time this has caused. Winding burnouts occur too frequently and I would hate to hazard a guess as to the power factor, but I feel that the ball-bearing motor is the more efficient."

# Single-Circuit, 19-Mile, 110-Kv. Line Cost Estimate

IN CONNECTION with the construction of a single-circuit, 110-kv. transmission line from Ayer to Tewksbury, Mass., the New England Power Company filed the accompanying cost estimate with the Massachusetts Department of Public Utilities, based on 1927 conditions. The right-of-way acquired was wide enough to permit the ultimate erection upon it of three 110-kv. or two 220-kv. circuits. The towers are spaced 6.8 per mile with 1.8 strain towers per mile. Eight- and nine-disk insulators are provided.

ESTIMATED COST OF 110-KV. LINE, SINGLE CIRCUIT
(Length, 18.96 Miles)

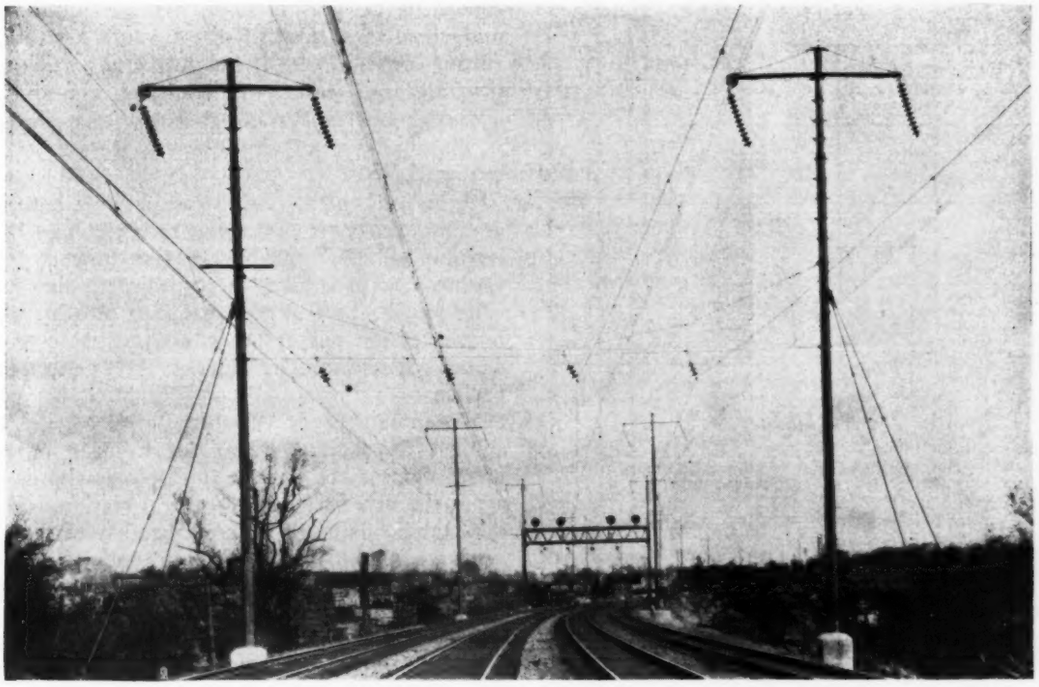
| | |
|---|---|
| Clearing and burning brush | $26,000 |
| Towers: | |
| Excavation | 20,500 |
| Setting footings | 13,400 |
| Distribution of steel | 7,000 |
| Erecting | 12,600 |
| Distributing miscellaneous material | 2,800 |
| Stringing power and ground wires | 14,000 |
| Towers, 50-ft. flexible steel | 49,400 |
| Power wires, one three-phase circuit, No. 4-0 copper, 13-ft. 6-in. horizontal spacing | 36,400 |
| Overhead ground wires, two ¼-in., crucible steel | 5,300 |
| Power insulators and hardware | 13,900 |
| Tie wire, protecting and splicing sleeves | 200 |
| *Right-of-way, 250 ft. wide; 125 ft. cleared | 96,700 |
| Total | $298,200 |
| Contractor's expenses, 10 per cent | 29,820 |
| Total | $328,020 |
| Engineering expense, 5 per cent | 16,410 |
| Grand total | $344,430 |
| Per mile | $18,166 |

*Sufficiently wide for additional lines.

# Railroad Electrification

**Causes for retarded application of electricity as motive power. Factors slowly forcing use, especially in population centers. Economy of purchased power through load diversity on central stations**

By N. S. HINMAN
*Commonwealth Edison Company, Chicago, Ill.*



*Curve-catenary construction Philadelphia-Wilmington division, Pennsylvania Railroad*

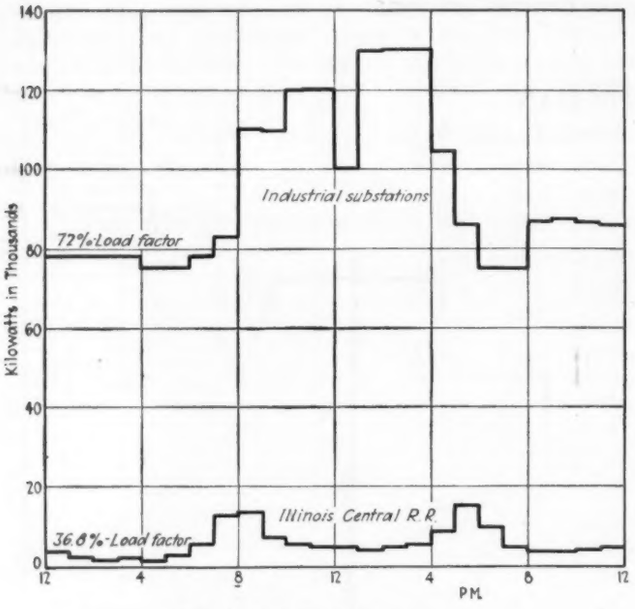
SINCE 1895 there have been about eighty instances of steam railroad electrification in all parts of the world. The development, however, has not kept pace with the increasing volume of the transportation load and the tremendous strides made, through the invention and improvement of apparatus, in the effectiveness of electrical energy for all kinds of power use. With an ever-growing intensity of traffic, with increasing values of land at terminals, of air rights and rights-of-way in the vicinity of population centers, with city governments crying against the nuisances of smoke and noise and with the constant demand for more speed and comfort on passenger trains, the days of the steam-drive locomotive, at least near population centers, would appear to be numbered.

Increasing capacity, both track and terminal, has its main importance in large city terminals, on main line heavily traveled roadbeds, and in particular in connection with suburban service. Thus the necessity for relieving congestion led to the electrification of the Pennsylvania stations in Philadelphia and New York and the Grand Central Terminal in New York. The acceleration of train movement was greatly increased, turning movements eliminated and switching greatly reduced. As cities increase in size and population density, the districts immediately surrounding them increase in population in an augmented ratio, making the demand on suburban train movement during morning and evening rush hours extremely heavy, while simultaneously the acquiring of additions to rights-of-way becomes an extremely costly and often physically impossible solution of the problem.

The use of multiple-unit electric trains has created a flexibility of suburban operation unattainable with steam. The lengths of trains are limited only by the lengths of station platforms, while the acceleration possible with these units greatly increases the average speed throughout the run. These two factors alone may make possible an increase in handling capacity of 50 per cent. To the people of Chicago the comparison between the suburban service of the Illinois Central under the old steam operation with that under present electrification affords a striking example of the possibilities of the latter. When congested terminals and heavy suburban services provide a high load factor on track and equipment the economy of electrification, particularly when savings due to increased capacity and to air rights are considered, is very material. The outstanding present-day example of favorable utilization of air rights made available by electrification through smoke abatement is to be found in the Grand Central station in New York, where it is claimed that the revenue derived from this source is equivalent to the fixed charges on the cost of electrifica-

tion. The electrification of the suburban service of the Illinois Central out of Chicago has, through the increase of passenger-carrying capacity, reduced the cost per passenger mile very materially.

The swift development of electricity and the increasing traffic problems of the railroads, both so recent and so filled with new questions of uncertain solution, are themselves reasons for the hesitation on the part of roads to electrify. The expense entailed in making a trial step in electrification is very high, and the results of an error in judgment or a new development in equipment requiring replacement might seriously affect the finances of the pioneering railroad. The development of electrical equipment for applying energy to railroading is not yet standardized except as to basic principles, and systems now in use vary greatly. Both direct and alternating current have their advocates, conversion apparatus is just emerging from the experimental stage, while voltages in use vary from 600 to 22,000. Furthermore, the future tendency as to size, weight and speed of trains is not clearly defined. This inability to forecast the future development of electrical equipment and train operation constitutes a retarding influence against electrification, as railroad officials are naturally reluctant to face possible later changes necessitated by varying future standards.

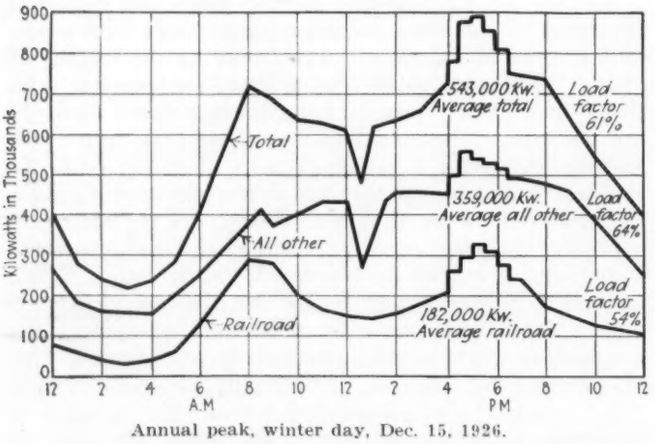



*Typical daily load curves*

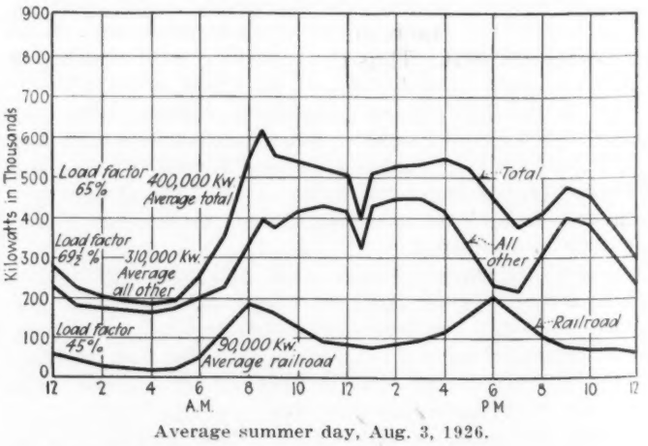
Note that the "valleys" of the Illinois Central load curve coincide in general with the peaks of the industrial substation load curve, illustrating very favorably the advantages of the diversity between these two loads.

Although railroad equipment may not yet be perfectly standardized, electrical energy in ample quantity and at a low price is already available, particularly in and around large centers of population. The advantages of mass production and diversified markets permit great operating savings through fuel economies, improved efficiency of generating equipment, reduced fixed charges and, most important of all, through high load factor resulting from diversity of load. These make available near all large centers of population a motive power more advantageous in respect to both price and quality than is obtainable through the employment of steam locomotives.

A major central-station company generates such great amounts of energy that the railroad load is but a small portion of the total. Its entire staff is trained in the business of producing and marketing energy. It is possible for the central station to use more efficient, because larger, prime movers than are available to the railroad alone. Large size in units and concentration of power reduce operating costs considerably. But the strongest argument in favor of the central-station company as against the isolated plant for railroad operation is the much lower fixed charges per kilowatt-hour which result from the diversity of the central station. This generally applicable business principle of diversity is nowhere so vital as in the business of producing electrical energy because of two inherent conditions: First, the high investment required per unit of capacity, and, second, the short duration of peak loads and the ordinarily large difference between maximum demand and average demand. In the production of energy for but one class of use this latter condition is aggravated to a point where the investment layout necessary to carry the maximum constitutes a very heavy burden, since it must be carried by a much smaller average demand.




Annual peak, winter day, Dec. 15, 1926.




Average summer day, Aug. 3, 1926.

*Typical load curves of Commonwealth Edison Company illustrating advantages of diversity*

In the left-hand graph, depicting load curves on a winter day, the load factor of "all other" is 64 per cent, compared to 54 per cent for the railroad load, while in summer the load factor on the day shown for "all other" is 65 per cent and that of the railroads 45 per cent.

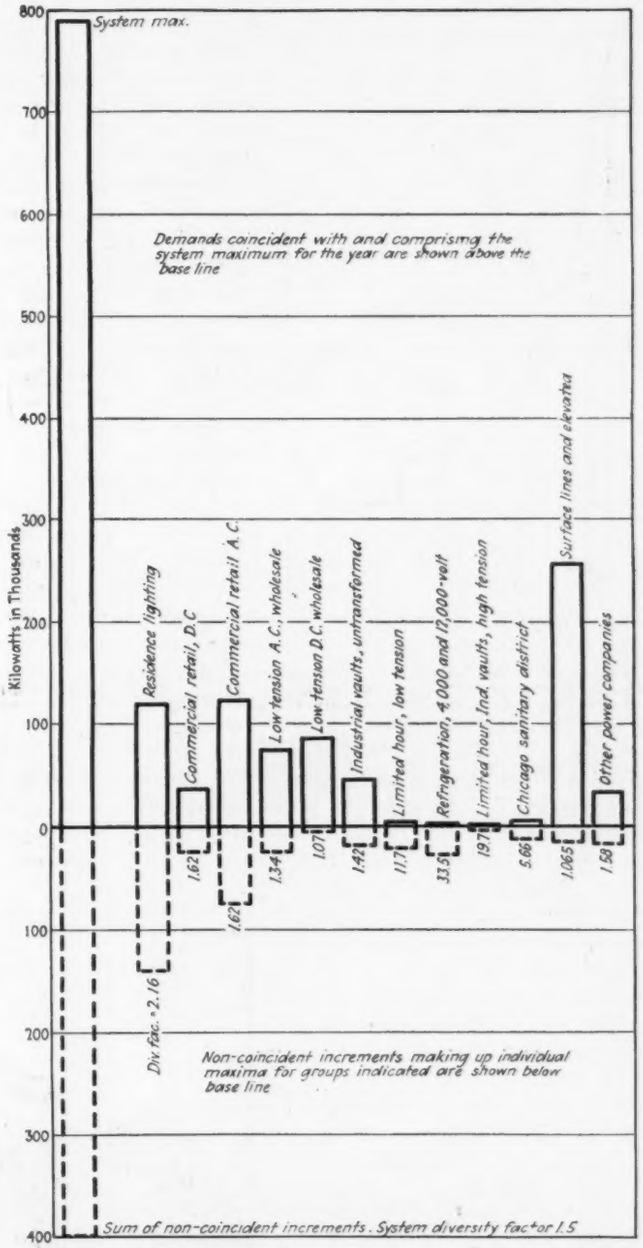
The seasonal drop in the daily average load between the winter day and the summer day is only 13 per cent for "all other," as compared to a drop of 50 per cent for the railroad load. The railroad curve represents the sum total of the surface lines, the elevated and the Illinois Central electrification.

Variation in demand is an hourly, daily and monthly variation. It is the aim of central-station companies to build up demand during off-peak periods by connecting on to the system loads whose maxima do not coincide with the system maximum. Thus, by combining the requirements of a great variety of customers, an increasing diversity of load is obtained, the use of the investment increased and the fixed charge per unit of production materially decreased. Such a procedure is impossible, or possible only within very narrow limits, when a single user or class of users are connected to the generating center. If railroad maximum demand came at the same time as the total maximum and if the load did not vary from hour to hour during the day and with the changing seasons there would be no advantage in central-station power other than the advantages of low operating costs, as distinguished from fixed charges, due to mass production. But experience indicates that the peaks of various loads do not coincide.

In general, it can be said that the morning domestic light and power load is declining, while the suburban and street railway load is increasing toward its morning peak at around 8 o'clock, as the population is carried to factory and office. Following this, the railroad load declines sharply, but the total is held up by the rise in the industrial load. In the evening the industrial load abates before the sharp evening peak on the railroad load. As this falls off the lighting load sustains that of the system. During the late evening and the early morning hours it is possible to add a special controlled load, such as ice manufacturing and other industrial uses, to build up the load factor.

The foregoing and the accompanying load curves indicate in a broad way the use of investment which can be obtained only through the connection of a varied load onto central stations. It can be readily understood that not only in technical and constructive problems, but also in the question of scientific employment of the necessary equipment through the economics of marketing, the central-station business is a very highly specialized one, requiring the utmost efforts of those engaged therein. Both the problem of obtaining energy at low operating costs through mass production and interconnection and that of increasing the use of the investment through diversity are possible only with the large diversified business of the central-station company.

In solving the many perplexing questions of railroad electrification, a mutual understanding of each other's problems by the railroads and the central-station companies is essential. Thus the nature of the railroad load curve, with its hourly and seasonal peaks and valleys, can be studied simultaneously with the load curves of other businesses supplied by the central station, with the end in view of building up load factor. In this connection the possibilities of developing the country adjacent to the rights-of-way through the availability of energy to farms and small communities are important. It is certain that to a large extent the investment in generating stations and some other equipment, especially near centers of population, has already been made and is available to the railroads. A survey of the total railroad requirements in any particular locality to learn the extent to which available generating stations can absorb the railroad load and what additional equipment may be necessary is a matter for joint action between the two industries. The question of transmission lines and equipment and distribution facilities along the rights-of-way can best be decided upon through co-operation, particularly where the distribution of energy to the adjacent countryside is a consideration. The standardization of equipment and apparatus is best approached through the combined efforts of the railroads, the electrical manufacturers and the central-station companies in order that the performance requirements desired by the roads be synchronized with the design of equipment




*Diversity chart—making $1 do the work of $1.50*

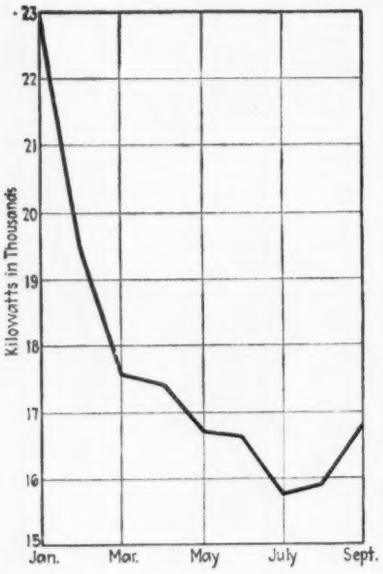
**Showing the diversity of large groups of customers on the Commonwealth Edison Company system for 1925 and illustrating the investment saving due to this diversity of business, which at $100 per kilowatt capacity for generating equipment alone approximates $40,000,000.**

for generation, transmission conversion and motive power.

No more outstanding example of the success of electrification wisely instituted through the co-operation of the railroad and the central-station company, resulting in minimized investment and power cost, can be found than in the case of the Illinois Central electrification in Chicago. During most of the year 1926 the Illinois Central operated its suburban service by steam at a loss of

$337,000. In 1927, operated exclusively by electricity, it is estimated the line will show a profit of almost half a million dollars. Simultaneously it has increased the number of trains 33 per cent, slightly reducing commuting rates, and enjoys a 20 per cent increase in patronage. Running time has been reduced from 10 to 22 per cent.

That the central-station company was able to deliver the required energy with no more than the normal increase in generating capacity is evidenced by the fact that maximum requirements of the electrification are around 23,000 kw., which come non-coincidentally with a maximum demand of the company's system of upward of 900,000 kw., while the total annual consumption of the railroad is estimated at 55,000,000-kw.-hr., as against 3,500,000,000 kw.-hr. for the whole system. From these figures it can further be ascertained that while the load factor on the entire central-station system was approximately 47 per cent, that on the 23,000-kw. maximum requirement of the railroad approximates only 27 per cent. The added utilization of required capacity as between the entire central-station system and that part necessary for the railroad alone brings out clearly the advantages of the diversity obtained through central-station generation of railroad supply power.




*Illinois Central Railroad load curves*

Average hour maxima for each month of the first nine months of 1927, illustrating month to month fluctuation of load.

The accepted basis on which the services of both the railroad and the central-station company are furnished being cost and not value, and the accepted policy of each being to sell its services at the lowest price compatible with a fair return on invested capital, their customer viewpoints coincide. Therefore, each party is seeking the same end and both can best solve their common problems through co-operation and a frank laying of cards on the table, to the end that these problems may be considered from all angles, present investment utilized to the maximum and future growth developed along sound, economic lines. This spirit of co-operation, if present in the negotiations of individual power companies and railroads, will do much toward the satisfactory solution of railroad electrification.

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# Truck-Mounted Gin Pole Reduces Pole-Setting Costs

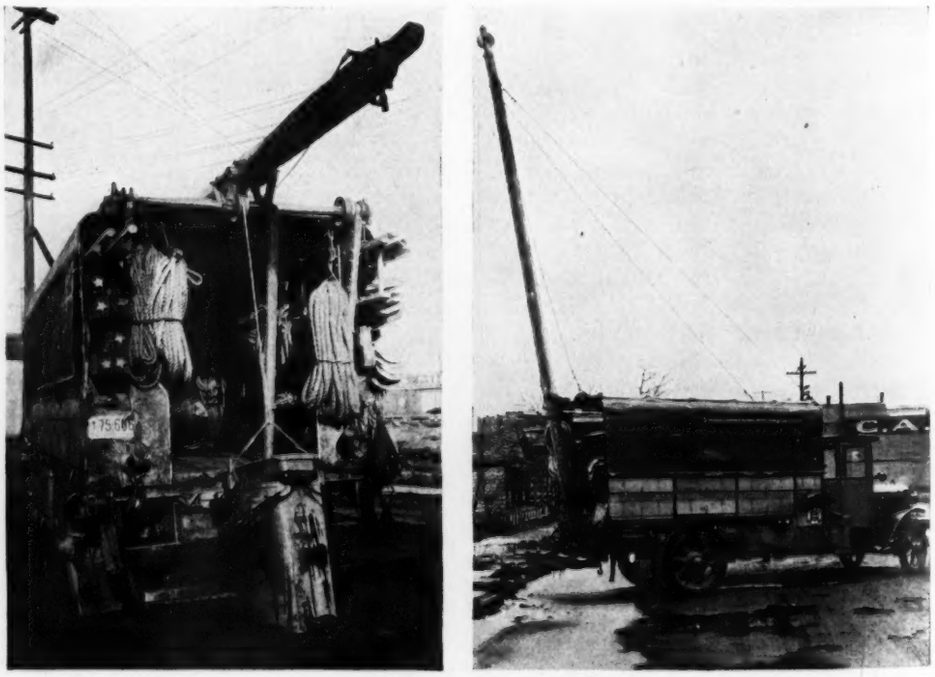
By D. A. Hord

*Superintendent of Distribution Northwestern Electric Company, Portland, Ore.*

HAND setting or similar methods of raising poles have been displaced by the Northwestern Electric Company, Portland, Ore., by a gin pole mounted on a line truck. While many utilities are now using equipment of this general character, the interesting feature of this truck is the method of mounting and supporting the gin pole and the fact that it is carried on an unusually well-equipped line truck instead of on a separate vehicle, as is so often done in similar practices.

The gin pole is shown in a lowered position for traveling and the overhead cross-shaft for hinging the pole is clearly indicated. Two lead sheaves are provided. When the one in the center is used for lifting transformers or other equipment the brace shown is used to prevent bending the shaft. Either sheave may be used for the pull line leading to a power-driven winch on the right front side of the truck. When traveling the upper end of the gin pole rests in a leather saddle at the forward end of the truck roof.

The gin pole is also illustrated in position with the four permanently connected guy cables tightened. The bottom of the gin pole fits into a socket on the rear center of the truck bed. Adjustable stiff-legs, at each rear corner of the truck chassis, are not lowered into position in the picture. The advantages of this equipment and the saving in cost of setting poles over former methods are so obvious that no comparative costs have been completed.



*Combination line truck and pole-setting rig minimizes equipment and labor costs*

# Financing Power Projects*

Utility executive constantly faced with financial and economic questions which are just as urgent as his technical problems

By C. W. Kellogg
*President Engineers Public Service Company*

THE fact that the problems of design and construction which are involved in good engineering often require the overcoming of great physical difficulties or the exercise of a very high degree of mental training, ingenuity and courage is quite likely to lead the engineer to feel that when these difficulties have been surmounted his problem has been solved. While undoubtedly there have in the past been many cases where the skill and ingenuity of some engineer has made possible the accomplishment of some useful work which would not have been done but for the engineer, yet I believe by far the most common case nowadays is one where the engineer cannot apply his skill and knowledge until first the money to pay for the work has been raised. And raising money involves not only ascertaining by study and analysis what the economic results of a given engineering project may be, but of showing those results to the people who have spare capital in such a convincing way that they will voluntarily invest their savings therein. In other words, even after the engineer can answer affirmatively the question "Can it be done?" he must still be able to answer satisfactorily the question "Will it pay?" and this answer must be in terms that will be clear and convincing to the untechnical business man. The larger the project the longer and more difficult the solution of the economic factors tends to become.

*C. W. Kellogg*

In the case of the Conowingo hydro-electric development it is a fair statement to say that it had been a definite project for 44 years before its final realization. The economic soundness of the enterprise could not be demonstrated until high-tension transmission was developed to the point of being able to carry the large output to market without excessive loss, until the market itself had developed an absorptive capacity sufficient to utilize the output and until there existed a steam-generated system large enough to relay the hydro plant during low flow.

The great project of a deep waterway from the Great Lakes to the sea, one of the greatest of our times, depends primarily on economic considerations. No one questions the ability of engineers to construct the dams, locks and power plants necessary or incidental to this project, or to estimate with reasonable closeness what they will cost, how much power and energy they will produce, how long they will take to build, but there is a great deal of question in various people's minds about the economic effects of making the huge investment which would be necessary. This project, instead of affecting 3,000,000 people, as does Conowingo, would affect more like 50,000,000 people, and, what is more, it would not affect them all the same way, which adds another very complicated feature to the subject. To my mind the economic limits of engineering are not a narrowing force for the engineer, but just the reverse. They are a challenge to his human as contrasted with his purely intellectual faculties. They oblige him to apply his skill and knowledge for the good of the community in its broadest aspects and thus make him a more useful citizen. The age in which we live is primarily one wherein nature's forces so long unused are being harnessed for man's benefit. It is not mere chance, but a sign of the times, that the man who during the last fifteen years has done more than any other individual for the benefit of mankind is its most eminent engineer, Herbert Hoover. It is also in line with my thesis that one of his most conspicuous services during the last five years has been along the economic lines of saving waste in industry.

### Does it Pay?

Lest it might be felt from the examples I have mentioned that I have reference only to great public works in considering the economics of engineering, I have only to remind you that the principle applies even to the smallest matters and even applies in the specific questions of effecting economies. In steam power plant design, for example, we all know that it is possible to produce a kilowatt-hour from less fuel than is now being done in any existing plant, but we also know that no sensible person is going to spend the money in investment to make that further possible fuel saving unless it pays to do so.

In this matter of fuel saving the economic questions far outweigh the purely engineering ones. For example, with a low load factor and cheap fuel it might be shock-

*Read before the Boston Section, A.I.E.E.

ingly bad economics to attempt to get even ordinary fuel economy. In northern Louisiana recently a power plant was erected at a point where approximately 300,000 B.t.u. in natural gas could be bought for one cent. Obviously any expenditure in plant investment to save fuel would be foolish, and what, in fact, was done was to utilize the cheap fuel to effect a saving in plant investment by cutting out every piece of equipment not absolutely needed. A very low investment cost per kilowatt was thus secured and still the fuel cost was less than one mill per kilowatt-hour.

The opposite extreme exists in one section of the country, where fuel is relatively high priced and system load requirements such that now stations can be operated at very high load factors. In such a case the relatively high investment cost necessary to secure the very latest developments for improved economy may be wisely made, not for the feat of beating a record for B.t.u. per kilowatt-hour but because, with the load factor and fuel cost obtaining, it pays to do so.

In the early days of engineering many problems of design and construction had not been solved. They were baffling and difficult, and when some of them had been solved the engineer might properly rest on his oars for a bit. Now, however, there are so many important ways in which engineering attainment has outstripped economic ability to utilize it that, whether he will or no, the engineer is forced into considering continuously the economic aspects of his business.

### Railroad Electrification

One of the great developments of the future is railroad electrification. Past engineering design and experience have absolutely answered the question "Can it be done?" It remains in each new project an economic question. In each case there is involved the great task of exposition of the advantages of electrification to officials drilled with decades of steam locomotive operation; there is also the question of railroad credit to finance these great electrification programs — the latter now happily much nearer solution than a decade ago—but both of these matters are essentially economic.

A special angle of the economic aspect of engineering is the matter of raising the money to pay for large construction projects, commonly called financing. While this is in the last analysis the problem of the investment banker, since his is the risk in buying the securities and his the responsibility in selling them to his clients, on the other hand the engineer should be familiar with the requirements of the situation, since it is one of the links in the chain connecting his conception with the actual carrying out thereof. Weakness in this link has been a frequent cause of good plans failing to come to fruition. The investment banker is used as representing the investing public, since his requirements merely represent what he knows his clients will demand before they will buy and because raising funds by direct public solicitation is usually quite impracticable.

Merely financing extensions of moderate size to an existing property need not concern the engineer. The new money is raised by a going concern either to pay for economies greater than the cost of the new money or to care for growth of business; in either case the money is raised on the company's own credit.

All financing is based on credit, and for a brand new project the establishment of the necessary credit is a matter in which the engineer plays an essential rôle. Investors are accustomed to buying securities on the basis of past earning power, based preferably on many years' record of performance; so that securities of a "construction project," not only without any earnings record but facing a year or two of construction period without any earnings, naturally meet with a good deal of what is commonly known as "sales resistance."

### Buyer's Credit May Be Used

This difficulty can be overcome by utilizing the credit of the company which is going to buy the output of the project, as was done with the credit of the Philadelphia Electric Company in the case of Conowingo, or through a contract or contracts for the purchase of the output, as was done through the Union Electric of St. Louis and other prospective customers in the Keokuk development.

Briefly, the method followed with the Conowingo project was this. The hydro companies, two in number, each owning the property respectively in Pennsylvania and in Maryland, were leased for 45 years to the Philadelphia Electric Company or subsidiaries owned by it at rentals sufficient to pay charges on the securities required to finance the project. In this way the credit of the project was as firmly established before construction began as though the water-power development were in fact one of the Philadelphia company's own power stations. In addition, the electric company definitely pledged itself to put up any money over and above that raised by the sale of securities that might be needed to finish the construction work. Through the arrangements mentioned Conowingo's credit was about as perfect as that of any privately built project could well be. A weaker credit position, paying more for the money, of course, would suffice, but in any case the credit must be there, either direct or remote, and it is impossible for the engineer to put his project through until it can be given a credit standing satisfactory to the investment banker.

This makes the establishment of earning power a problem the engineer must solve. It involves a study of markets and rates and often lengthy negotiations with consumers. The Keokuk project was authorized by act of Congress in 1905 and five years of study and negotiation for the establishment of the market for its output were required before the project could be financed. Even when the act of Congress was passed 60 years had elapsed after the original reconnaisance of Robert E. Lee, then a captain of engineers in the army, before the arrival of economic conditions made the development feasible.

Millions of horsepower in water power in this country have been surveyed, analyzed and studied by engineers and are now waiting the development of markets for their product satisfactory as to size and location before they can be developed. They are feasible as engineering projects, but the sun of economic need has not yet risen for them.

Engineering will continue for an indefinite future to concern itself with applying scientific knowledge to human use. During the last 50 years the engineering difficulties of working out these applications were so great that they required all the energies and ingenuity of the engineer. Latterly, however, I believe, as I stated at the outset, that the emphasis is shifting to the problem of applying them on sound economic lines. The effect of this latter development is greatly to broaden and to humanize engineering. No longer is the engineer merely the designer of structures and machines and the builder of great works. In future he must to an ever-increasing extent co-ordinate his expert knowledge and experience with the economic requirements of the body politic.

# Non-Supervised Substations

**Economic and public relations considerations. Steel structures for 22 kv., 33 kv. and 44 kv. used by the Alabama Power Company are simple in design and operation**

By S. J. SPURGEON

*Distribution Engineer Alabama Power Company, Birmingham, Ala.*

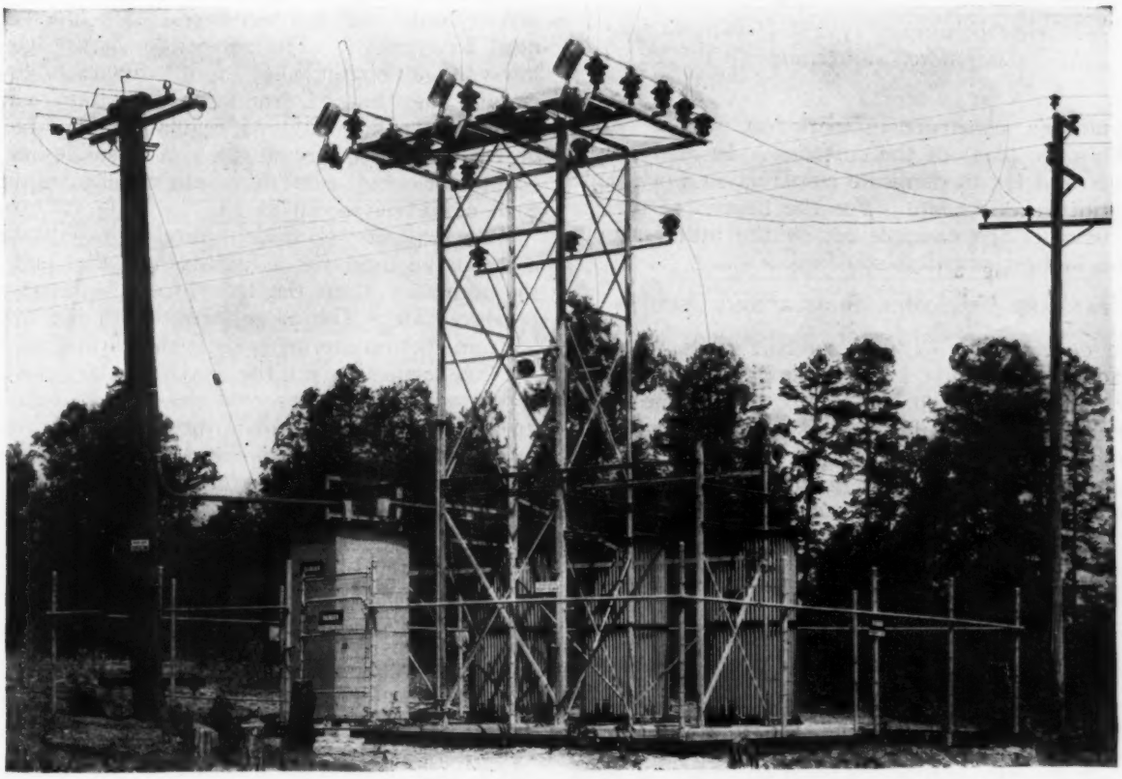


*Fig. 1—Non-supervised outdoor substation used by the Alabama Power Company*

MANY factors enter into the design of non-supervised distribution substations other than merely securing the maximum use of the equipment necessary to meet a specific set of conditions. The chief factors to consider are the policies and practices of the particular utility, the economic phases and the effect on public relations and on electrical construction carried on by the customer. Local conditions, load density, character of load and accessibility are the most important factors in determining the policies and practices of any one utility. Any one of these may be the determining factor in setting the policies and practices in connection with any individual substation. However, all of these factors must be considered jointly in order to arrive at a general policy and to determine what general practice must be followed.

The economic phase is usually the one factor that should receive the most consideration, quite often to the exclusion of all others. The initial cost must have a place in the economic phase, but against this must be balanced the cost of maintenance and operation. Different designs will necessitate different expenditures for maintenance and operation. As is well known, the cheapest design is seldom the most economical, since the difference in the cost of maintenance and operation of a cheaply built and a higher priced substation will often more than cover the overhead expense on the difference between the initial cost of the two substations. In case the added initial expenditure greatly benefits the service obtained from the higher priced substation the expenditure is justified.

Public relations can be greatly improved by careful selection of substation apparatus by appealing to community pride through the visible property. Any community appreciates the effort made by a public utility to uplift a district through pleasing construction work. The quality of service to the customers also pays good dividends in public good will. Any substation must be so constructed that service is interrupted only under extraordinary conditions and then with the least possible outage.

Consideration must also be given to the influence

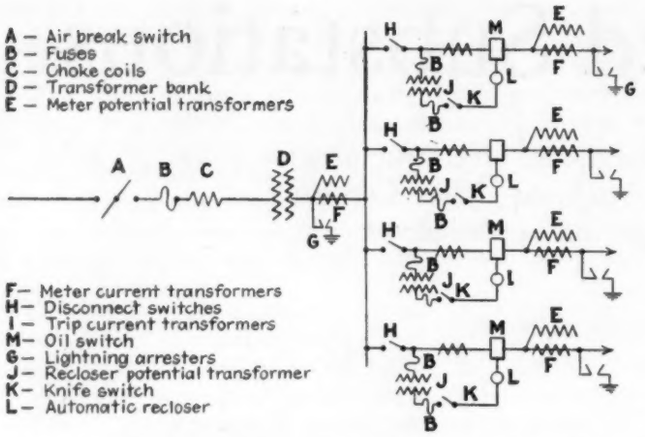

A — Air break switch
B — Fuses
C — Choke coils
D — Transformer bank
E — Meter potential transformers
F — Meter current transformers
H — Disconnect switches
I — Trip current transformers
M — Oil switch
G — Lightning arresters
J — Recloser potential transformer
K — Knife switch
L — Automatic recloser

*Fig. 2—Wiring diagram of typical 44-kv. unit type step-down substation*

of the utility's construction work on similar work done within the plant of the customer. In many cases a customer will try to duplicate construction work done by the utility serving him. For the benefit of service to any customer the example set by the utility should be of the highest practical standard.

### Standard Customer Substation Used

In the development of the standard customer substation for the Alabama Power Company's system all of these points have been considered. It will be noted from the accompanying illustrations that steel has been used almost exclusively so as to obtain a permanent substation and also secure a high salvage value. These substations are very simple in design and operation. The greater number of the non-concentrated loads of this utility consist of comparatively few customers and a substation having highly flexible switching facilities is not necessary. It is, however, necessary to provide a substation that can be adapted to almost any available location. It was for loads of this class that the unit type substation treated herein was developed.

This substation is adaptable where it is desired to install outdoor high-voltage equipment and either indoor or outdoor low-voltage equipment. Because of the many applications and arrangements of the low-voltage equipment, only the outdoor low-voltage arrangement will be considered here, together with the 22-kv., 33-kv. and 44-kv. high-voltage side.

The complete outdoor substation installed for 44 kv. is shown in Fig. 1. When used for 33-kv. or 22-kv. service only the insulators and switching equipment need be changed. The substation shown has but one low-voltage circuit, but four duplicate low-voltage circuits may be fed from this substation without any alteration. Outdoor type regulators may be installed on each outgoing circuit. A typical single-line diagram for a four-circuit substation with metering equipment on each circuit is shown in Fig. 2.

The structure is made entirely of galvanized steel and can be used for a high-voltage line pulling in on the structure from the transformer side or from the opposite side. The arrangement with the line coming in from the transformer side is shown in Fig. 3. When the line comes in on the opposite side, the air-break switch at the top is reversed and the two outside phases drop directly to the transformers and the middle phase to the long delta bus at point *A*. The side on which the line comes in depends upon the arrangement required for the low-voltage circuits. It will be noted that the

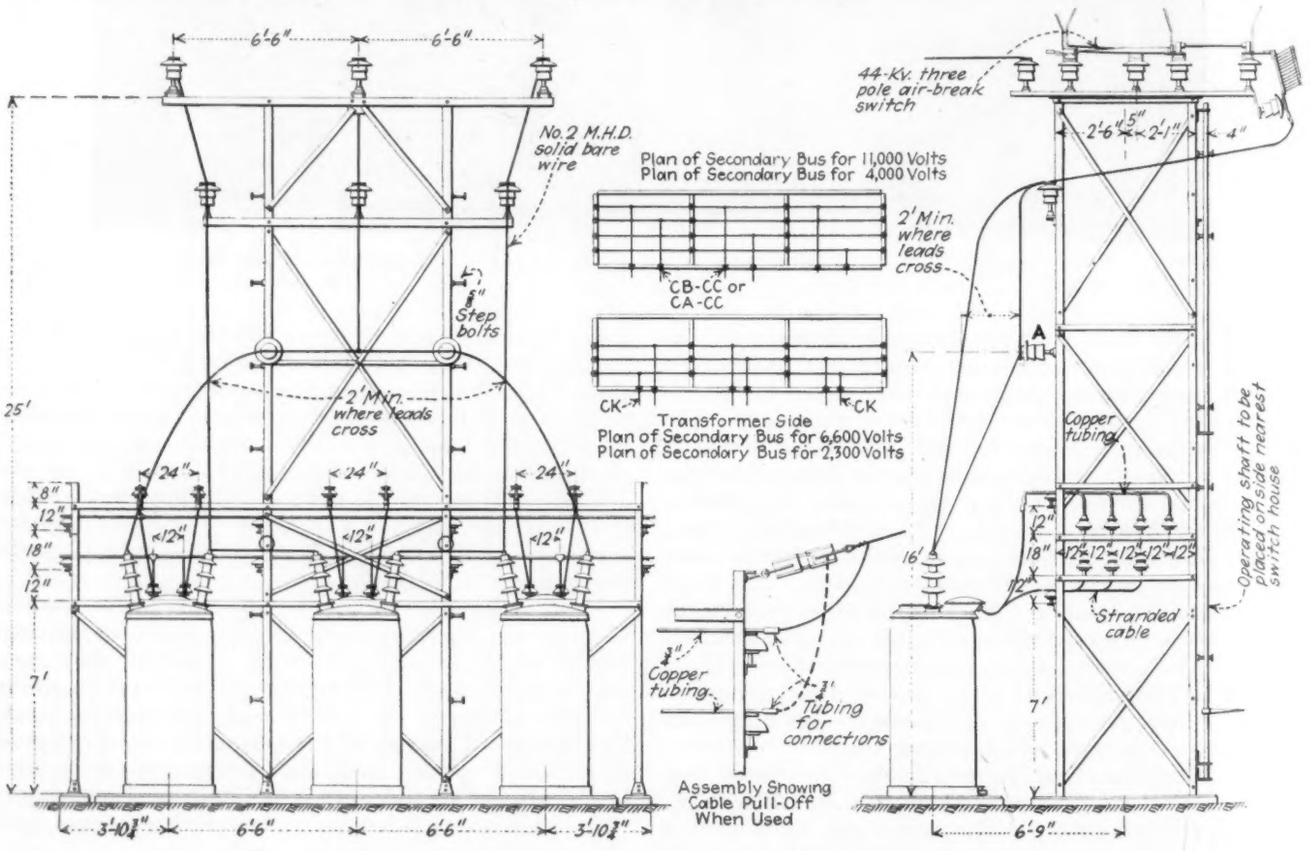



*Fig. 3—Switch-gear assembly for double secondary transformers under line*

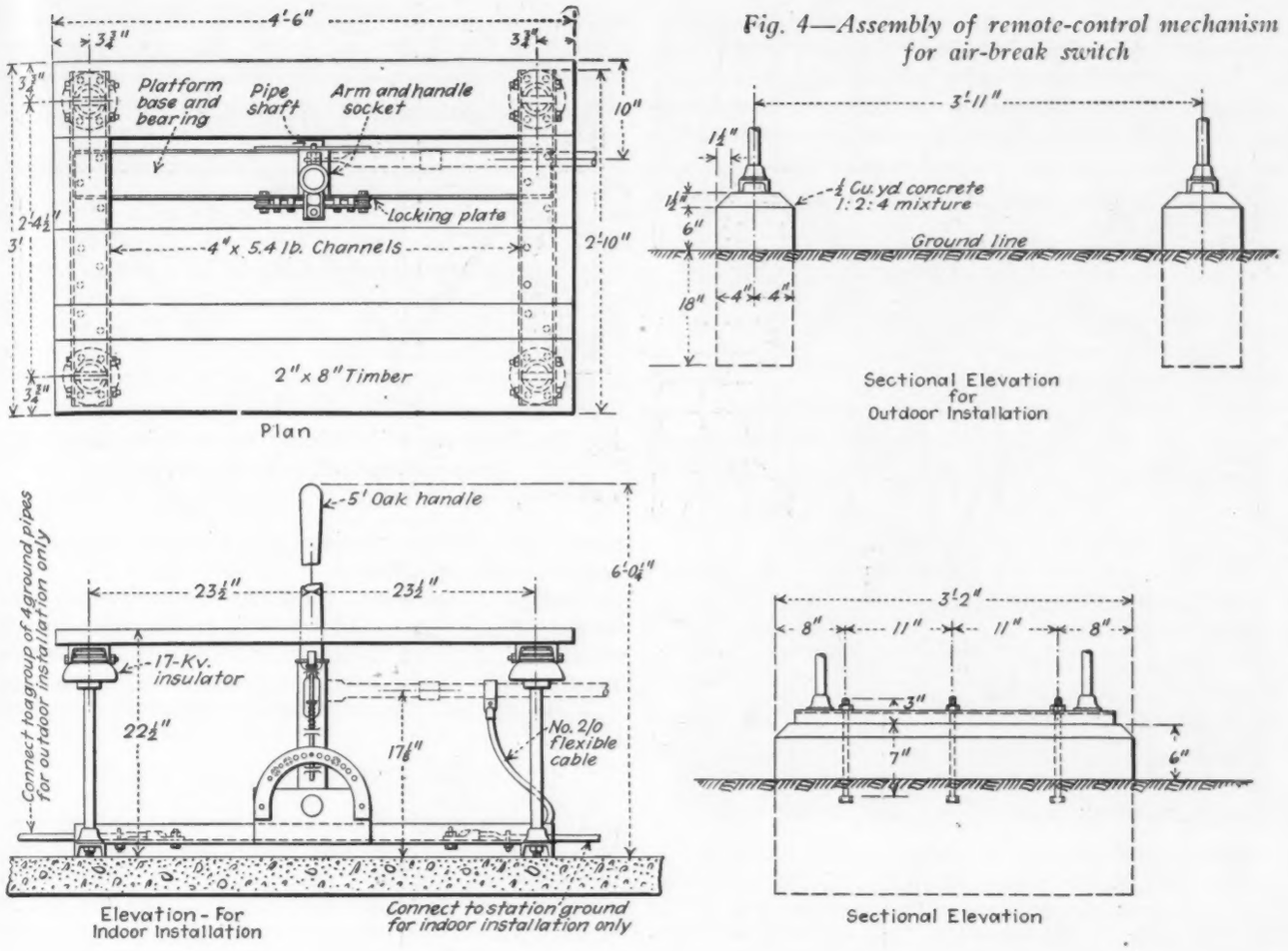



*Fig. 4—Assembly of remote-control mechanism for air-break switch*

structure has a double low-voltage bus, which makes it possible to serve two voltages by using triple ratio transformers. When one voltage is all that is required, the double bus feature can be used to facilitate the installation of the totalizing metering equipment when this is used. The height of the transformers is not a limiting factor in the application of the structure, since there is no obstruction above the transformer foundation.

The high-voltage switching and protective equipment consists of an air-break switch, fuse and choke coil, all mounted as a unit on a single channel, which not only reduces the cost of the equipment to a marked degree but also facilitates construction considerably. The switch is controlled from the ground by the remote operating mechanism shown in Fig. 4, installed adjacent to the structure. This type of operating mechanism was adopted as a safety measure in order to remove the operator from the range of falling porcelain and to insulate his body from ground in case of the failure of an insulator on the switch while being operated.

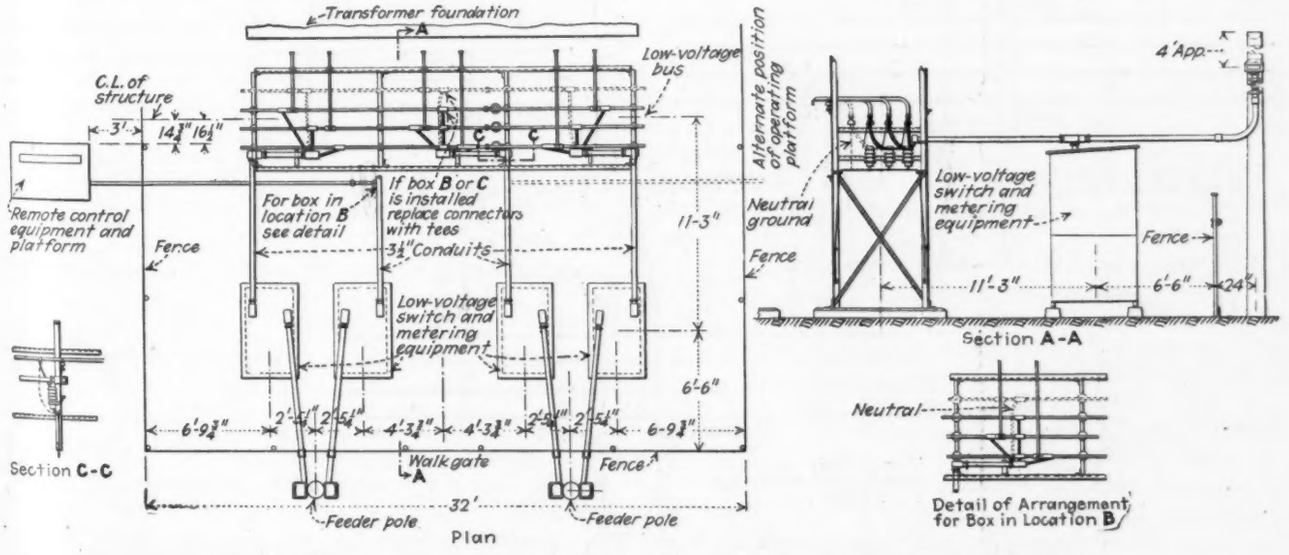
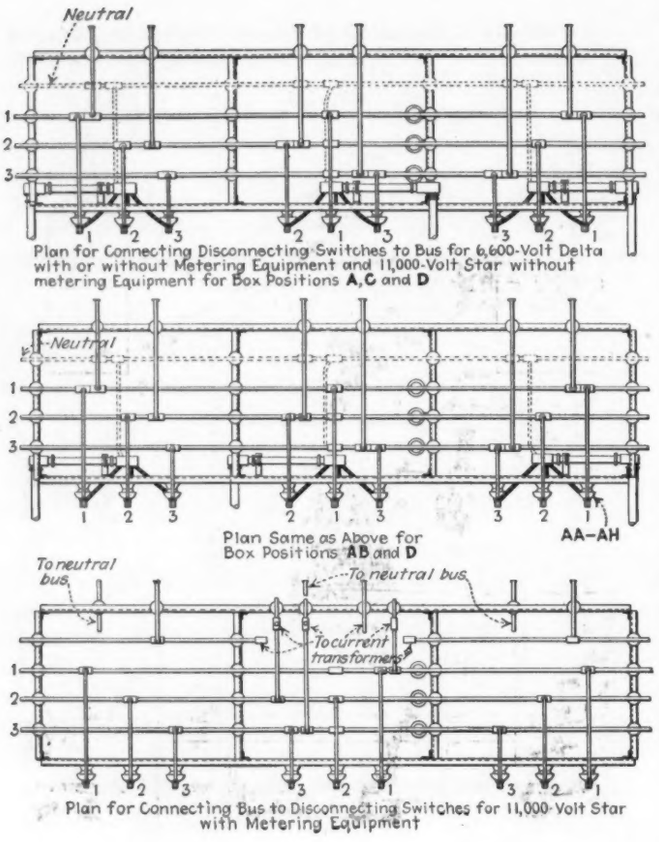



*Fig. 5—Arrangement of low-voltage feeder switching and metering equipment*


Neutral
Plan for Connecting Disconnecting Switches to Bus for 6,600-Volt Delta with or without Metering Equipment and 11,000-Volt Star without metering Equipment for Box Positions A, C and D
Neutral
Plan Same as Above for Box Positions AB and D
AA–AH
To neutral bus
To neutral bus
To current transformers
Plan for Connecting Bus to Disconnecting Switches for 11,000-Volt Star with Metering Equipment

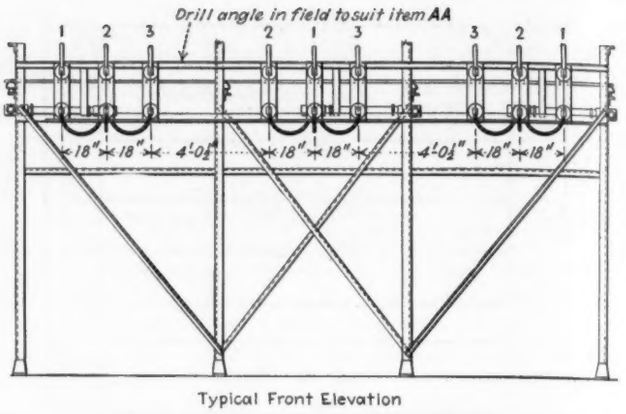



*Fig. 6—Mounting of disconnecting switches used when low-voltage side is 6,600 or over*

The fuse in the protective unit is of the expulsion type and uses copper wire within a micarta tube for the fuse link. When the fuse link melts under overload, the micarta tube automatically opens, thus preventing the re-establishment of an arc across the tube after the fuse arc is ruptured. The tower is provided with steps and a platform on top to facilitate the replacement of fuses. This type of high-voltage equipment is sturdy and has given service commensurate with many other more expensive types of equipment used to secure similar results.

Open delta capacity is ordinarily provided at substations of this type, but where it is deemed advisable to provide a spare transformer, it is installed on the opposite side of the structure from the main bank and a quick method of connection is provided as shown in Fig. 7.

## Low-Voltage Bus Installation

The lower part of the high-voltage structure serves as a support for the low-voltage bus. This bus and bus structure are so constructed as to facilitate the connection of the individual circuits. The bus proper is made of copper tube and is supported on porcelain insulators. When it is desired to totalize the energy output of the station, the current and potential transformers of the outdoor type are conveniently located on the structure. When it is desired to meter the output of a bank connected in star on the low-voltage side, the double bus feature is used. The neutral bus is carried

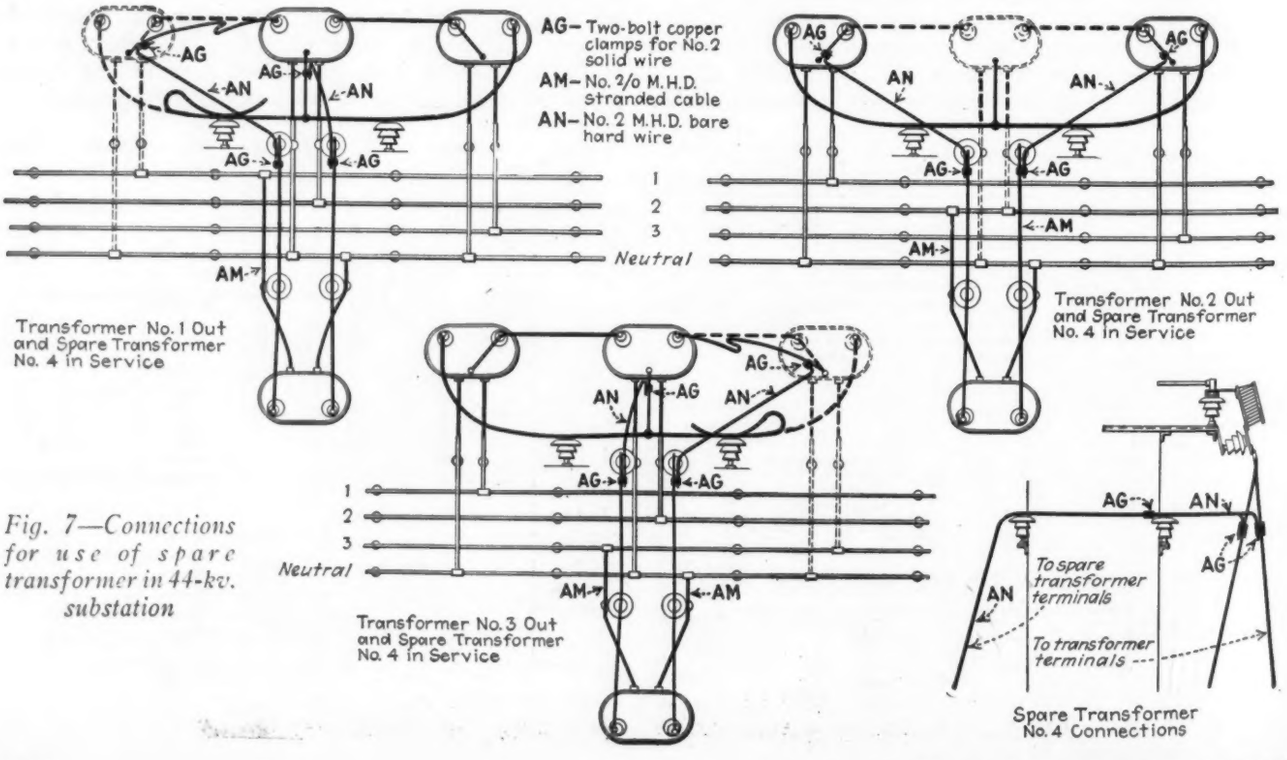

AG– Two-bolt copper clamps for No. 2 solid wire
AM– No. 2/o M.H.D. stranded cable
AN– No. 2 M.H.D. bare hard wire
Neutral
Transformer No. 1 Out and Spare Transformer No. 4 in Service
Transformer No. 2 Out and Spare Transformer No. 4 in Service
Transformer No. 3 Out and Spare Transformer No. 4 in Service
To spare transformer terminals
To transformer terminals
Spare Transformer No. 4 Connections

*Fig. 7—Connections for use of spare transformer in 44-kv. substation*

in the lower bus position in the star connection. The metering equipment, which is ordinarily composed of a watt-hour and demand meter, is installed in the meter box mounted below the low-voltage bus, the leads from the instrument transformers being carried to the box through conduit.

The low-voltage switching and metering equipment is located adjacent to the high-voltage structure, as shown in Fig. 5 and is housed in a steel cabinet. Each cabinet contains all equipment necessary for an unregulated circuit except the lightning arresters, which are mounted on the pull-off pole. The connection from the bus to the cabinet is made with cable in conduit.

This cabinet can be equipped for all voltages up to 13,200. Cabinets to operate at voltages less than 4,000 can be equipped with disconnecting switches. When cabinets are used for voltages ranging from 6,600 to 13,200, it is necessary to mount the disconnecting switches on the structure as shown in Fig. 6, on account of the greater size of the potential transformers. Each cabinet is fitted with an oil switch, watt-hour meter, demand meter, curve-drawing voltmeter, current and potential transformers for the meters, current transfomers for tripping, disconnecting switches in cabinets except for 6,600 to 13,200 volts, automatic reclosing device and a 200-volt-ampere potential transformer for operating the recloser.

The metering equipment, disconnecting switches, voltmeter and automatic closing device are optional and may be left out of the assembly if desired. To make the oil switch manual it is necessary only to remove the recloser and in its place install a boiler steel plate and face plate as shown in Fig. 8. A 600-volt assembly

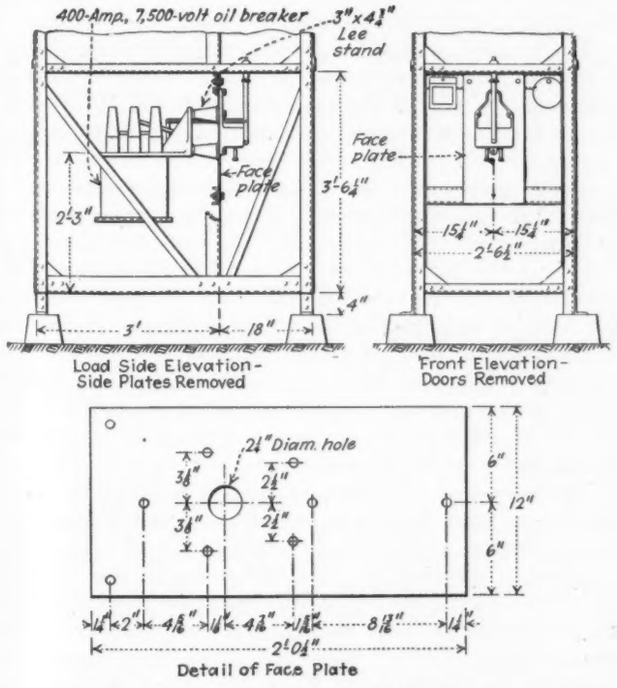



*Fig. 8—Feeder switching and metering box without recloser*

with the sheet-steel covering removed is shown in Fig. 9. This is complete with all possible equipment with the exception of the curve-drawing voltmeter. The disconnecting switches are equipped with barriers. The recloser is completely automatic and in case of trouble locks out the circuit after one, two, three or four predetermined reclosings. If the trouble clears before the recloser has made the predetermined number of reclosings, the mechanism resets and is ready for another cycle. The recloser is fitted with a trip-free attachment

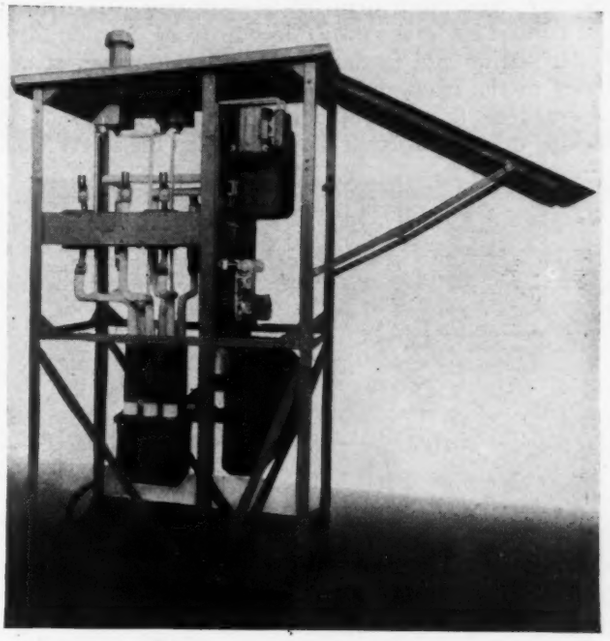


*Fig. 9—A 600-volt metering and switching assembly*

and also with series-tripping equipment. The tripping equipment may be fitted with either an instantaneous or an inverse time limit attachment.

If it is desired to open the switch by hand, it is necessary only to turn a small lever at the top of the recloser, which trips out the switch and opens the motor circuit, thus preventing it from reclosing. The switch can then be reclosed automatically or by hand. If it is necessary to reclose the switch by hand, this is done by a hand lever at the side of the reclosing mechanism.

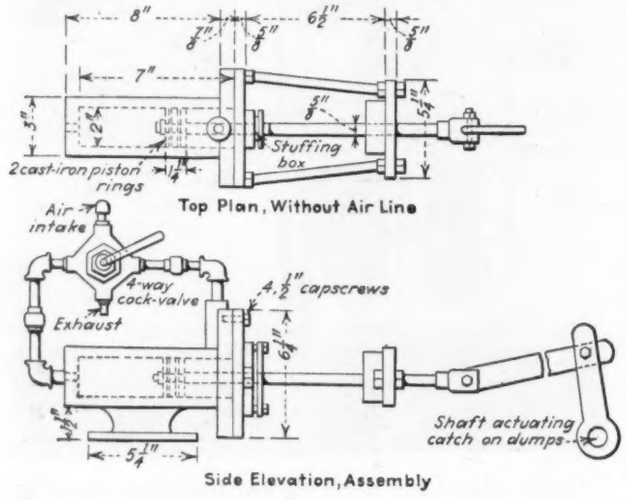
The outgoing feeder is pulled through conduit, Fig. 5, to the first distribution pole, where the lightning arrester protection is installed. In the case of a four-circuit substation two poles are used, allowing the conduit runs to be decreased to a great extent.

This type of substation has proved very economical in that it has a very high salvage value, field construction costs are a minimum, since practically everything used in its construction is fabricated in the shops before being shipped to the job, maintenance is low due to the permanent character of the installation and operating costs are low, since the automatic recloser takes care of all trouble beyond the low-voltage oil switch. Any trouble between the high-voltage fuse and the low-voltage oil switch will blow the fuse on the high-voltage structure.

A substation of the type discussed with an all-steel fence inclosing it has a very pleasing appearance. The public respects clean-cut and well-designed construction work such as is employed in these substations. Customers also find in this work a model for any electrical construction work they may be doing and often ask for engineering assistance from the utility organization on the strength of a piece of construction work done by the utility forces. This, of course, should be encouraged rather than discouraged.

## Air-Tripped Steam Dumps Prevent Accidents

EIGHT 750-hp. boilers at the plant of the Salem Electric Lighting Company equipped with mechanical stokers are operated on a schedule requiring the use of steam dumps more than 40 times a day. The dumps are tripped by levers projecting up from the side of the boiler setting and in the past caused a number of accidents to the operator's hands resulting from the short leverage of the control and occasional failure of the locking dogs to function properly, when the levers would




*Top and side views of dump control cylinder*

fly back with great force and strike the operator. These accidents have been eliminated by cutting off the upper portion of the lever and actuating the lever and dump by the pressure cylinder mechanism illustrated, which utilizes compressed air at 90 lb. per square inch. The device was designed by Owen A. Jackson, chief engineer of the Salem company, and built by James O'Donnell, boiler room engineer, and Thomas E. Moose, machinist of the station staff.

## Merchants' Association Formed to Sell Appliances


By G. A. Kumler
*Assistant Merchandising Manager*
*Portland Electric Power Company, Portland, Ore.*


FAILURE of appliance campaigns to produce the desired volume of sales led the Portland (Ore.) Electric Power Company and the Northwestern Electric Company, the two central stations serving Portland, to conclude that either the public had been campaigned to death or that their merchandising departments were at fault. A plan is now being tried out which it is hoped will bring about increased sales.

It was found that there were about fifteen merchants in Portland dealing in electrical appliances and that three or four of this number were as good merchandisers as the power companies, if not better. Eleven of the merchants were invited to a dinner and after a frank discussion of the situation it was decided to form an association, which was called the "Electrical Appliance Retail Association," to bring about more ethical selling practices and greater co-operation. The association meets once a month and has an executive committee, composed of seven members, which does most of the work. The power companies send out notices and there are no dues. When a campaign is to be carried on all members tie in on several large advertisements, with each member's name appearing. In addition, advertisements will appear in other parts of the paper by individual members. Only approved merchandise will be sold.

The plan has been in effect too short a time to judge of its effectiveness, but it is felt that fifteen retail appliance outlets, all working together, will be able to do a much better selling job than the two power companies working alone.

## Operating Costs of Electric and Gasoline Trucks Compared

DURING preparations early in the spring of 1927 for the Christmas business in December, 1927, the management of the Eleto Company estimated, according to Joseph Husson, president of that organization, that it would require six more ¾-ton gasoline trucks for the delivery of Lord & Taylor and James McCreery & Company's packages in the suburban territory beyond the limits of New York City. This company was operating six ¾-ton gasoline trucks entirely within the city limits and the average mileage of any one of these trucks did not exceed 28 miles per day. The problem was one of purchasing additional gasoline trucks and assigning them to work in the suburban territory and leaving the existing gasoline trucks on the 28-mile city routes, or purchasing electric trucks for city routes and transferring the existing city gasoline trucks to suburban territory.

The problem was solved by purchasing six new electric trucks and transferring the existing short-route gasoline trucks in city work to the suburban territory. The justification for this procedure was based on operating savings of the electric trucks, as given in detail in the accompanying table. A close study of the tabulation shows that all items which would remain the same whether gasoline or electric trucks were used are not tabulated, but are considered to balance off in the comparison. The comparison of the totals of columns (2) and (5) with the total of column (3) led to the purchase of six new electric trucks, four of ½-ton capacity and two of 1-ton capacity. The four ½-ton electrics were used to replace ¾-ton gasoline trucks in package delivery work and the two 1-ton electrics were used to replace ¾-ton gasoline trucks for hotel special deliveries.

The estimated difference in the cost between the ½-ton electric and the ¾-ton gasoline truck in the package delivery service, as previously outlined, is $1.54 per day in favor of the electric. The difference in cost between the 1-ton electric and the ¾-ton gasoline truck on hotel special deliveries is $1.28 per day less in favor of the electric truck. At an estimated approximate saving in favor of the electric of $1.50 per day, the total saving in favor of the electrics would be $9 per day or $2,700 per year of 300 service days.

While this saving led to the purchase of two types of electric trucks, it will not provide any net saving until five years have elapsed on account of the increased initial cost of the electrics as compared to the gasoline trucks. The ½-ton electrics average $3,540 each. For four such vehicles the total cost was $14,160. To this must be

COMPARATIVE DATA FOR ELECTRIC AND GASOLINE TRUCKS

Cost items which remain the same whether gasoline or electric trucks were used are not tabulated, but are considered to balance after the comparison.

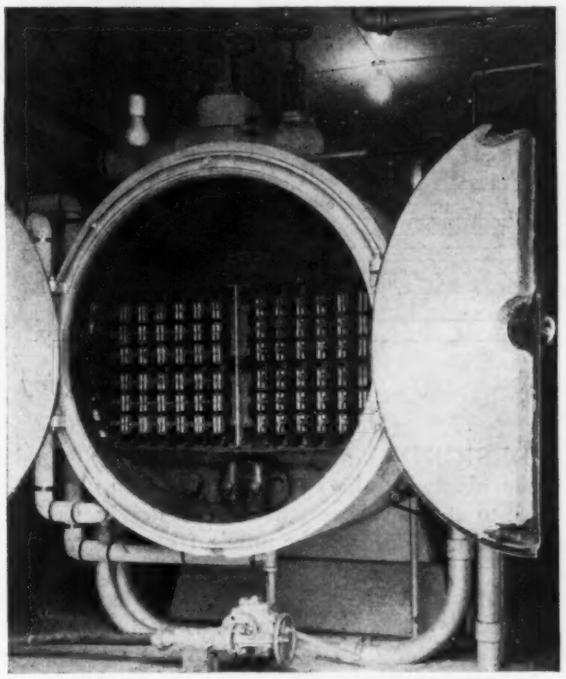
| | Present Out-of-City Electrics 4-Ton (1) | Estimated Cost New Electrics 4-Ton (2) | Estimated Cost Second-Hand Gas Trucks ¾-Ton (3) | Present Gas Trucks ¾-Ton (4) | Estimated Cost New Electrics 1-Ton (5) |
|---|---|---|---|---|---|
| **1926 Costs per Day** | | | | | |
| **Operating charges** | | | | | |
| Gas | ..... | ..... | $0.74 | $0.74 | ..... |
| Oil | ..... | ..... | 0.07 | 0.07 | ..... |
| Electric charging | $0.84 | $0.84 | ..... | ..... | $0.84 |
| Tires | 0.15 | 0.15 | 0.37 | 0.37 | 0.15 |
| Drivers | 5.47 | Same | Same | 5.50 | Same |
| Helpers | 3.26 | Same | Same | 4.45 | Same |
| Ferriages | 0.45 | None | None | ..... | ..... |
| Liability insurance | 0.53 | 0.53 | 0.71 | 0.71 | 0.53 |
| Total operating charges | $11.00 | $1.52 | $1.89 | $11.84 | $1.52 |
| **Maintenance Charges** | | | | | |
| Electric mechanics | 0.72 | 0.72 | ..... | ..... | 0.72 |
| Mechanical repairs: Labor | ..... | ..... | 0.22 | 0.22 | ..... |
| Material | 0.13 | 0.13 | 0.38 | 0.38 | 0.13 |
| Body repairs: Labor | 0.16 | 0.16 | 0.49 | 0.49 | 0.16 |
| Material | 0.07 | 0.07 | 0.18 | 0.18 | 0.07 |
| Greasers and oilers | ..... | ..... | 0.78 | 0.78 | ..... |
| Washing | 0.17 | Same | Same | 0.53 | Same |
| Garage rent | 0.45 | Same | Same | 0.45 | Same |
| Maintenance overhead: | | | | | |
| Foreman and assistants | 0.15 | 0.15 | 0.65 | 0.65 | 0.15 |
| Garage general | 0.22 | 0.22 | 0.54 | 0.54 | 0.22 |
| Porters and watchman | 0.04 | Same | Same | 0.30 | Same |
| Miscellaneous | 0.19 | Same | Same | 0.57 | Same |
| Total maintenance charges | $2.32 | $1.45 | $3.24 | $5.09 | $1.45 |
| **Fixed Charges** | | | | | |
| Interest | ..... | 0.07 | 0.03 | ..... | 0.08 |
| Depreciation | 1.28 | 1.04 | 0.51 | 0.91 | 1.31 |
| Fire insurance on trucks | 0.02 | 0.04 | 0.02 | 0.02 | 0.05 |
| Fire, fidelity and miscellaneous insurance | 0.14 | Same | Same | 0.21 | Same |
| Total fixed charges | $1.44 | $1.18 | $0.56 | $1.14 | $1.44 |
| **Business Overhead Charges** | | | | | |
| Office overhead | 2.00 | Same | Same | 2.68 | Same |
| Vacation and bonus reserve | ..... | ..... | ..... | ..... | ..... |
| Officials, delivery superintendents and assistants | 1.24 | Same | Same | 1.44 | Same |
| Clerks and cashiers | 0.98 | Same | Same | 1.06 | Same |
| Porters and watchmen | 0.11 | Same | Same | 0.35 | Same |
| Routers and assorters | ..... | ..... | ..... | ..... | ..... |
| Office sundries | 0.92 | Same | Same | 1.17 | Same |
| Rent of store premises | 0.40 | Same | Same | 0.42 | Same |
| Warehouse expense | 0.08 | Same | Same | 0.28 | Same |
| Group life insurance | 0.07 | Same | Same | 0.09 | Same |
| Rent of warehouse | ..... | ..... | ..... | ..... | ..... |
| Suburban night transfer | ..... | ..... | ..... | ..... | ..... |
| McCreery transfer and return | 0.75 | Same | ..... | ..... | Same |
| Total business overhead charges | $6.55 | ..... | ..... | $7.46 | ..... |
| Total costs | $21.31 | $4.15 | $5.69 | $25.53 | $4.41 |
| | | | $4.15 and $4.41 | | |
| Less cost per day with electrics | | | $1.54 and $1.28 | | |

added the cost of two 1-ton trucks at $4,395 apiece. This gives a total investment for the six electric trucks and bodies of $22,950. The cost of the gasoline truck equipment, figuring $800 for a second-hand ¾-ton truck put in first class shape and $700 for the body, gives a total cost per vehicle of $1,500 or $9,000 for the six. The cost of the gasoline equipment is thus $9,000, as against $22,950 for the electric truck equipment, making the electric truck equipment cost $13,950 more. At an operating saving of $2,700 per year it will take five years before this difference in cost is balanced off to show net savings in favor of the electric trucks.

A tabulation of maintenance costs, covering a period of seven years and presented by Mr. Husson at the Electric Truck Conference recently held in New York City, will appear in an early issue.

## Electric Boiler Uses Hydro Surplus

FOUR months' experience with an electric boiler at Lewiston last winter proved to the Central Maine Power Company that surplus hydro power from Gulf Island could be economically utilized in the company's auxiliary steam plant for heating its office building and



*Heating units applied to steam boiler allow flexible operation*

an adjacent hotel and theater. Set against the operating cost of heating by fuel oil at 5 cents per gallon, this hydro-electric energy had a value of from 3.02 to 3.84 mills per kilowatt-hour. Data on the operation of this unit are given herewith, the returns being weighed in the absence of a steam flow meter which will be available for next winter's runs.

The boiler consists of an International Engineering Works unit 66 in. in diameter x 19 ft. over all, containing 72 tubes 3 in. x 16 ft. each. It was built for a working pressure of 125 lb. and is rated at 120 hp. It is equipped with 1,200-kw. heating units divided into four 440-volt circuits and automatically controlled by four pressure governors and a Copes water regulator. The General Electric Company furnished the electrical equipment. A saving of about $25 per day over fuel oil, including labor economies, is being attained, according to R. D. Morrison, industrial engineer of the utility.

*Value of Surplus Hydro Power vs. Fuel Oil for Steam Heating, Lewiston, Me.*

| Month | Temperatures, Fahrenheit — Average | Average per Day Maximum | Average per Day Minimum | Kw.-Hr. Maximum per Day | Kw.-Hr. Minimum per Day | Kw.-Hr. Total Month | Water Lb. Return | Lb. Return per Kw.-Hr. | Cost per Month* with Fuel Oil | Value Surplus Energy per Kw.-Hr. |
|---|---|---|---|---|---|---|---|---|---|---|
| December, 1927 | 28.9 | 38.8 | 13.5 | 16,800 | 9,900 | 414,700 | 957,000 | 2.33 | $1,601.70 | $0.00387 |
| January, 1928 | 22.7 | 37.5 | 2.5 | 18,500 | 11,300 | 502,900 | 1,100,000 | 2.22 | 1,675.85 | 0.00334 |
| February, 1928 | 22.7 | 39.3 | 6.3 | 18,600 | 12,000 | 469,900 | 1,025,000 | 2.20 | 1,415.80 | 0.00302 |
| March, 1928 | 30.3 | 39.5 | 16.5 | 17,400 | 10,600 | 410,300 | 840,000 | 2.05 | 1,575.90 | 0.00384 |

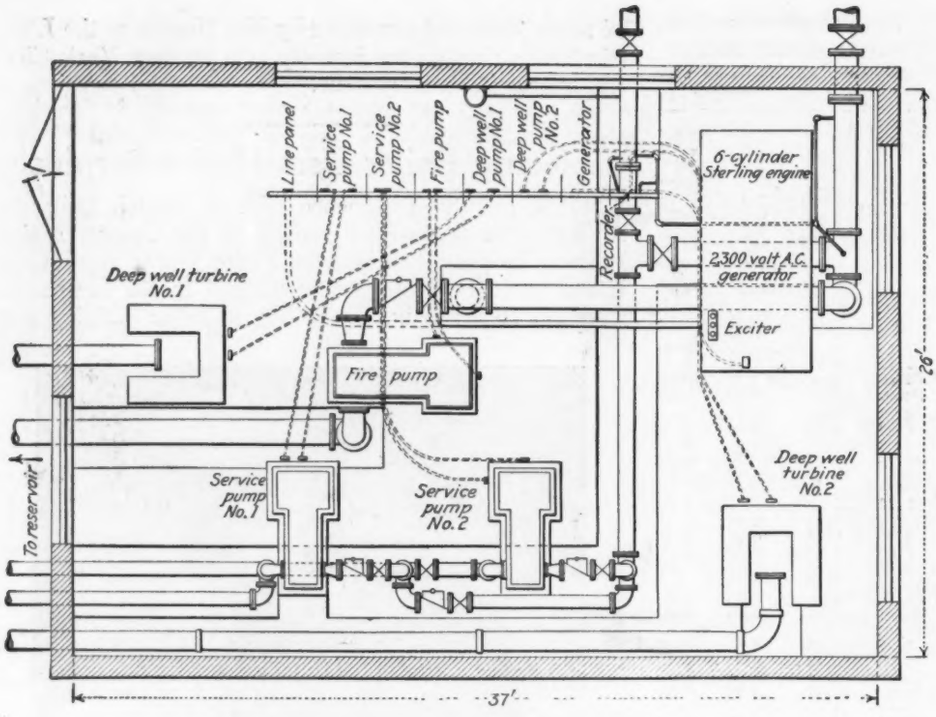
* Fuel oil operating costs per month are those of December, 1925; January, February and March, 1926.

# Automa

## *for Water*

By H. A. TOLBURG

*Superintendent of Water Department, Kewanee, Ill.*




*Plan of Monmouth pumping station*

IN DESIGNING and building the new municipal water plant for the city of Monmouth, Ill., it was decided to make the installation as nearly perfect as possible in order to free the public from all unnecessary expenses in future operation and at the same time place the city in a lower class of insurance risks as classified by the Illinois Inspection Bureau. Another aim was to remove the water department from the curse of local politics as much as possible by reducing the labor requirement in operation. This was all accomplished by the installation of full automatic electrical control of all pumps and motors.

The pumping plant includes two deep-well turbine pumps, two 3-in. horizontal centrifugal service pumps, one 6-in. horizontal centrifugal fire pump, all pumps being driven by 2,300-volt, slip-ring induction motors. Stand-by equipment consists of a 90-kw., 2,300-volt, 60-cycle, three-phase generator direct connected to a 225-hp. Sterling gasoline engine having starter, oil gages and speed controls.

The two deep-well pumps deliver 1,000 gal. per minute each into a 750,000-gal. reservoir, the service pumps deliver 450 gal. per minute each into the system and the elevated tank, which tank has a capacity of 125,000 gal. with a total head of 140 ft. The fire pump delivers out of the reservoir into the system at two speeds, the first 1,000 gal. per minute at 80-lb. pressure and the second speed 1,500 gal. per minute at 105-lb. pressure. The fire pump is served by two control panels, one panel being full automatic, started from either the central fire station or the pumping station by push-button controls, the central fire station being ½ mile from the pumping station. The other panel which controls this pump is a manually operated one of special design and is used in case of failure in the automatic control circuits. The piping from the fire pump to the mains is so arranged that as soon as the pressure is raised above the elevated tank pressure a swinging check valve closes and cuts out the elevated tank, and as quickly as the pressure is cut down to the elevated tank pressure the check opens and the tank is again floating on the distribution system. The switchboard was designed by the Sundh Electric Company, Inc., Newark, N. J.

The automatic features are controlled by pressure regulators and float switches placed in the reservoir and on the distribution system. The float switches are arranged to give a 4-ft. regulation in the reservoir and these switches control the two deep-well pumps. The pressure regulators on the service pumps are so arranged that should the demand be greater than the capacity of the No. 1 pump, then the No. 2 pump will cut in automatically and stay on the line until the elevated tank is full. These pumps are arranged on the board so that they can be alternated and either of them be used as a stand-by. The piping of the service pumps is laid out in such a manner that they can be operated in series to assist the fire pump in case of an extraordinary demand. The elevated tank is protected from being exhausted of its water supply by a pressure regulator on the switchboard so that an alarm will ring should the water supply become dangerously low.

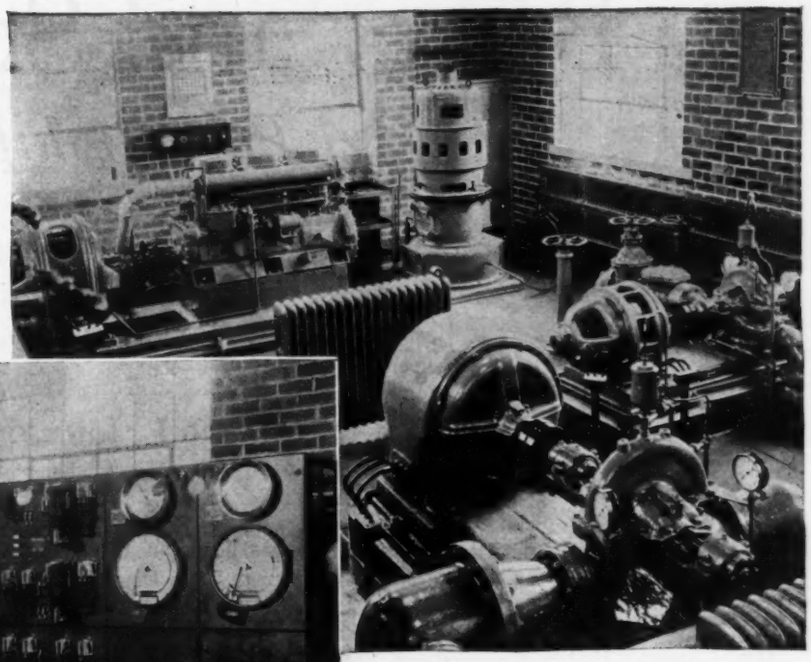
### PROTECTED BY INTERLOCKING RELAYS

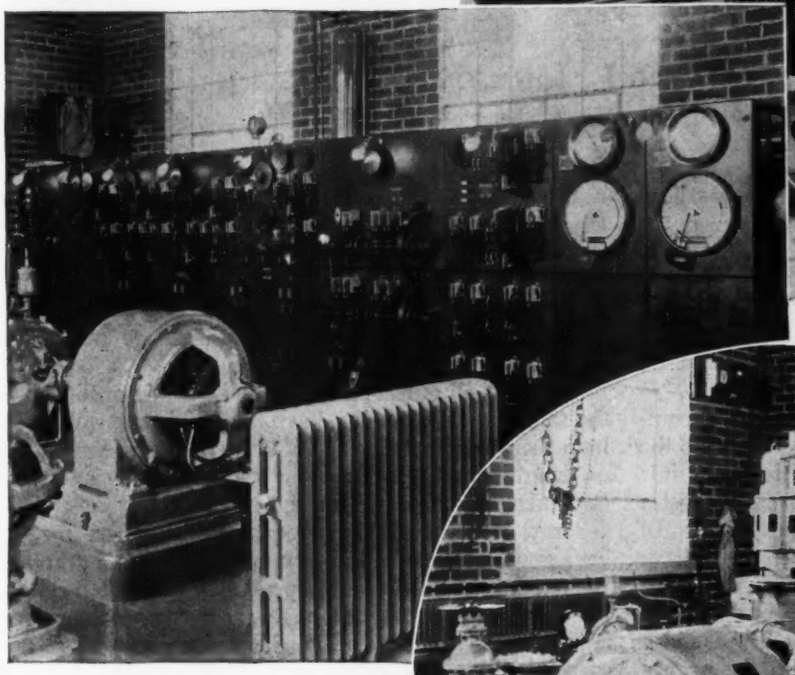
The switchboard in all consists of ten panels arranged as shown on the drawing. The incoming line panel is provided with one three-pole, double-throw oil circuit breaker equipped with inverse time-limit overload in each phase, undervoltage release and auxiliary contact to close and ring the alarm on panel No. 4 when the breaker opens on either side; this switch is interlocked so that it is impossible to put the line and generator on the buses at the same time. There is also provided on this panel one reverse phase relay of undervoltage release type with necessary interlock relays to open the oil circuit breaker in case of reversal or failure in line voltage. There are mounted on panels Nos. 9 and 10 two General Electric flow meters, indicating, recording, and integrating gallons per minute.

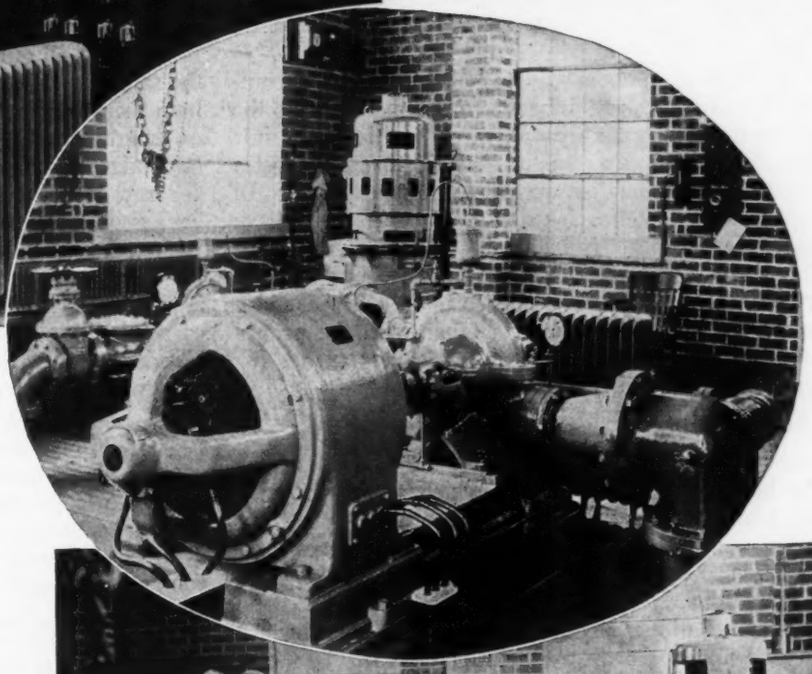
Prior to the installation of this equipment in the pumping station it was costing the city of Monmouth $45 per day for fuel and labor, pumping 490,000 gal. per day from three wells with air compressors. Today it is pumping a total of 550,000 gal. at a power cost of $14 per day and one attendant part time, who re-

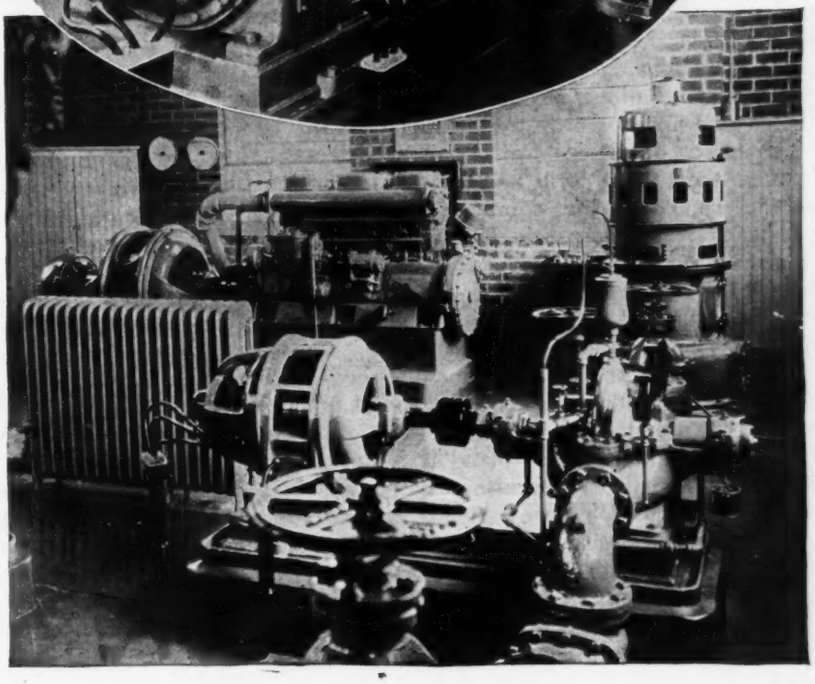
# a tic Control

## er *Pumping*









ceives a wage of $115 per month, making a total cost of $17.85 per day or a pumping cost delivered into the mains at 3¼ cents per 1,000 gal. The total cost of the wells, reservoir and equipment exclusive of the elevated tank was $117,000, which is being retired at the rate of $12,000 per year.

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*Top—General view of pumping station floor*

*Left—The switchboard is arranged for automatic operation on energy either from the power line or from the stand-by unit*

*In oval—The fire pump, double suction and the second deep-well pump*

*Bottom—One of the deep-well turbine pumps, one of the service pumps and the stand-by gasoline engine*

# Buyer and Seller—
## *A Partnership*

**Successful principles upon which the purchasing of a prominent electrical manufacturing company has been organized with price cutting eliminated**

By EDWARD L. JOHNSON
*Purchasing Agent Black & Decker Manufacturing Company, Towson, Md.*

BECAUSE of the general interest which has been developed in the subject of price cutting and in the ethics and economics of purchasing, in the series of articles that have been appearing in the ELECTRICAL WORLD, I believe that a statement of the policies of a manufacturer's purchasing department might be of interest. It may serve to contribute another sidelight on this discussion.

In establishing purchasing principles for this company, we have strongly adhered to the policy that the supplier of any commodity we use is entitled to a fair margin of profit, even as we, as manufacturers, expect a fair profit on merchandise we sell to our customers. In the selection of material for our own products we have always endeavored to consider first and foremost the quality of these materials in relation to their application and requirements, letting the cost to us be the secondary factor. We think this policy, together with the proper manufacturing equipment and labor, is responsible for the general reputation of our product.

### STUDYING SOURCES OF SUPPLY

Furthermore, we have always paid considerable attention to the sources of supply with which we deal or wish to deal, making special efforts to cultivate the friendship and good will of our suppliers. We have not confined this practice to their sales forces alone, but, by frequent plant visitations, have made the acquaintance of their factory organizations, whom we consider the men behind the guns. In other words, we look upon our main sources of supply as departments of our own business. Merely because their plant is in another city, operating under another name, does not eliminate the fact that they are producing parts for use in Black & Decker tools. By this practice we are able to gather quite a good deal of knowledge concerning materials and parts purchased for our tools, as well as the conditions and difficulties surrounding the manufacture of them.

If a purchaser knows the commodities he is buying and the factories producing them, he knows when he has prices that are in keeping with production costs and a fair amount of gross profit and it is not necessary to follow the practice of securing competitive bids on a wholesale scale. When we feel that the price of a commodity which we have been buying from an old source of supply is too high, considering market conditions, we take the question up immediately with this source, rather than go out after competitive bids and remove the business to a new source. In such cases, we very often visit the plant of the seller, at which time all cards are laid on the table, cost figures gone over and usually an agreement reached that is satisfactory to both parties. Our suppliers welcome this policy, as they realize that we are willing to work along with them and are playing the game on the Golden Rule basis.

We want all our suppliers to make a fair profit, but, at the same time, hold costs down to a minimum. We often help them accomplish this by suggesting different means of handling and routing our work and by increasing schedules, so as to enable the seller to buy or contract for raw materials in larger quantities. These methods have generally resulted in economies to us as a purchaser without affecting the gross profits of the seller. When the purchaser and seller have the proper contact with and confidence in each other, there is not very much need of competitive bids, or business being awarded on a cold-blooded price basis. Furthermore, changing sources of supply with every order placed or requirement released is costly to both the seller and the purchaser. Neither one has had the opportunity to learn much about the personnel, plant operation, etc., of the other, and without this knowledge they cannot work together to the best advantage.

In many cases, we have been dealing with the same companies supplying us with certain commodities for a period of ten years and more, yet have been able consistently to produce our own equipment at lower costs and market it at a lower price each year to our customers. This is due, in a measure, to our ability to lower our own production costs from time to time, but we have also been aided materially by our suppliers working with us in an effort to furnish our materials at the lowest possible price, consistent with quality of material and their making a fair profit on the sale of same. No business relations can be profitable unless both parties reap benefits from the transactions.

### FAIRNESS INSURES CO-OPERATION

We have dealt with some foundries for years without moving a pattern and feel confident we have fared better than if we had followed a policy of shifting our work from place to place, merely because some one else offered a little cheaper price than we were paying. We know, nearly as well as the foundries, what it costs to produce our work, the amount of metal required, the number of molds it is possible to get from a machine per day and

the approximate amount of foundry rejects. From what they tell us and what we see by visiting their plants, we know what their overhead is and can tell when they are selling at the right price with due regard for their profits.

Through this policy with our suppliers we have got co-operation and assistance in emergencies which we could not demand or hope to get on short acquaintance from companies which we were making fight to the last ditch to get our business. In many cases our principal sources have worked overtime and Sundays to get our stuff out and help us out of a jam, without raising prices a penny. Why? Because we play the game fairly with them and they are above taking an unfair advantage of us in such emergencies.

### Mutual Protection

There is another angle to this co-operative procedure which bears consideration. Whenever we reach a point where competitive conditions arise in our own field and we have to alter prices on our products we feel that the first move is to study our own equipment and facilities, to see what can be done toward effecting economies in our own plant. The results and benefits of these studies are very often passed on to our suppliers and aid them in their own production methods, which, in turn, reacts to our adavntage as well as the sellers'.

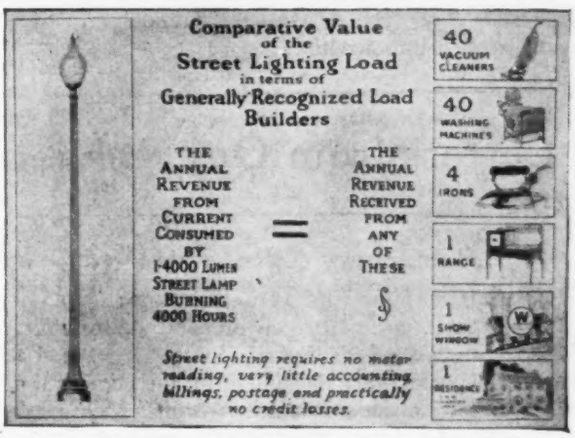
Today we are in the midst of a buyer's market, but this condition will not last forever. Sooner or later we are going to have a return of the seller's market, the same as existed not so very long ago. It is then that we expect to reap the real benefits of our Golden Rule policy and fair play toward our sources of supply. When material and shipments are hard to get and we need prompt deliveries, we believe most of our suppliers will be glad to come through and help us out, not forgetting our treatment of them during the buyer's market period. The purchaser who runs a regular auction sale with his buying is sooner or later going to get it in the neck, because those sellers who are now being ridden over roughshod are not going to forget. When the seller's market returns, these auction sale operators, as well as the companies they represent, are surely going to pay the freight, reaping as they have sown. We may be all wrong, we may find that we have overestimated the value of a policy such as we have fostered, but certainly it has not been proved to us yet, and past history does not indicate that it will.

### Profitless Operation Disastrous

I consider it very poor practice for manufacturers to cut their prices deliberately to secure business, with no regard for profit. These fellows are, as I call it, buying business, with no profit to themselves, and are inevitably headed for receivership and, ultimately, the rocks. The successful manufacturing plant must, in figuring its prices, take into consideration material costs, labor costs and factory overhead, as well as general sales and administrative expenses. It owes this not only to itself, but to the stockholders of the company, to whom it must ultimately answer. In the final analysis, the officers of any company are only men who are intrusted with stockholders' money which they must invest profitably, and unless they give proper consideration to this fact and can show a certain percentage of profit on each sale they can never hope to build up a healthy financial condition within their organization and increase the value of their company's stock or other securities. Unless this is accomplished, they must eventually come to grief.

## Revenue Value of Street Lighting

ADEQUATE street lighting was stated by L. A. S. Wood, at the recent annual convention of the Missouri Association of Public Utilities, to be the proper remedy for the crimes and accidents occurring during the hours of darkness. It was pointed out that with a well-balanced rate schedule and suitable methods of finance the sale of street-lighting service is a profitable branch of the public utility company's business and that the value of the street-lighting load is constantly increasing. Although the hours of burning may vary with the seasons, they total 4,000 per year, which is undoubtedly a longer period than any other load, except a few of special nature which exist in some metropolitan areas. The load factor, said Mr. Wood, is approximately 46 per cent for a 4,000-hour schedule, and while it may include part of the evening peak, it also ranges through the midnight to morning valley. Revenue from street lighting is assured


Comparative Value
of the
Street Lighting Load
in terms of
Generally Recognized Load
Builders
THE ANNUAL REVENUE FROM CURRENT CONSUMED BY 1-4000 LUMEN STREET LAMP BURNING 4000 HOURS
=
THE ANNUAL REVENUE RECEIVED FROM ANY OF THESE
Street lighting requires no meter reading, very little accounting billings, postage and practically no credit losses.
40 VACUUM CLEANERS
40 WASHING MACHINES
4 IRONS
1 RANGE
1 SHOW WINDOW
1 RESIDENCE

*Comparative load value of street lighting*

through periods of industrial depression, as well as prosperity. There are rarely any bad debts or loss of revenue from this source.

The scope of the street-lighting load was foreseen as becoming continually wider, since in addition to street lamps the modern city requires traffic signals, warning beacons, underpass and viaduct lighting and highway lighting, all of which present additional and constantly increasing opportunities for augmenting the central station's revenue. More show-window lighting invariably follows improved street lighting. Inadequately lighted stores are dim and unattractive in comparison with the well-illuminated streets, and thus a source of additional revenue is added when an improved street-lighting system is installed. "When compared with other load-building services which the central stations are aggressively promoting street lighting is in a class by itself," Mr. Wood concluded.

## Loads to Be Expected from Radio Equipment

HOW much does radio reception contribute to the per-customer usage of electrical energy? This is a question which has probably arisen in the mind of every commercial department head who is seeking ways of making his domestic customers bring a bigger return on the investment and operating expense required to serve

them. In the past several evidences have been presented to indicate how radio reception has increased use of lights in the home. Following are some figures that have just been collected by *Radio Retailing* from radio manufacturers which may be the basis for calculating the direct effect of radio equipment on energy consumption:

For example, the average demand of eight different competitive receivers is 65 watts. Set A requires approximately 40 watts; set B (six-tube), 34 watts; set C, 45-50 watts; set D (six-tube), 50-55 watts. Sets E and F, using one of the original alternating-current tubes, require considerably more power and bring the average up to the figure quoted.

Power speakers, of which three well-known types were investigated, draw even more current. Type A power cone demands 100 watts and type B around 190 watts.

The average A power unit takes 110 watts, the average trickle charger uses 20 watts, "socket-power" B units average 25 watts. Receivers using battery tubes with rectifying equipment for A, B and C supply average 100 watts.

As *Radio Retailing* points out, "It can easily be seen that it is not safe to multiply the total number of receiving sets by one average figure because of the differences in demand." The type of equipment and hours of usage must be taken into account.

# Letters from Our Readers

## *Reinvesting Called Preferreds*

*To the Editor of the* ELECTRICAL WORLD:

I want to congratulate you on your editorial entitled "Reinvesting Called Preferreds." It has seemed to me that utilities, which are dependent on the good will of the general public, make a mistake in calling their preferred stocks without at least permitting the owner to participate in the new preferred issue.

There are several cases in hand, one of which is Duquesne. Duquesne called its 7 per cent preferred and issued a new 5 per cent preferred without any chance for the owner of the old preferred to exchange for the new preferred. The same action is being taken by Engineers Public Service, and presumably will be taken by Niagara Falls Power.

While I can appreciate that it may cause delay and book-keeping, it would seem comparatively simple to state to an owner of a preferred which is to be called that the amount due him at the called price of the old stock will, upon request, be applied on the purchase of shares of the new issue at the price at which it is to be marketed. If a fraction of a share results, the owner of the old stock should be given the privilege of making up the difference so that he would receive whole shares. This would benefit the owner of the preferred stock in several ways:

First—He would be saved the immediate payment of income tax on the appreciation of the old stock.

Second—It would save the owner of the old stock the broker's fees in purchasing the new stock.

Third—It would enable him to get the new stock at the issue price, which often jumps before the old owner has a chance to get a whack at it.

It should save the utility some of the cost of the bonus which it allows the broker who handles the entire issue. Certainly such action would create good will, whereas the present method is creating more bad will than the utilities appreciate.

H. R. SARGENT.

Bridgeport, Conn.

## *Opposes Trading After Receipt of Bids*

*To the Editor of the* ELECTRICAL WORLD:

I have been reading the various articles on price cutting in the ELECTRICAL WORLD. I do not think a purchasing agent, if he buys on an ethical basis, can initiate price cutting. This responsibility rests entirely with the manufacturer or jobber, as the case might be. My idea of ethical purchasing methods is to give all manufacturers or jobbers who are qualified to supply the material wanted an opportunity to quote. When quotations are received and tabulated the lowest bidder, quality of material considered, should be given the business.

A purchasing agent should never give any one bidder an opportunity to revise his prices or trade in any way in an attempt to throw the business to one particular man or manufacturer. Should this practice be pursued the purchasing agent's firm will eventually pay higher prices for the material. After the business has been placed I do not think it is the prerogative of the purchaser to tell the losing bidders why they lost the business.

The above is in direct conflict with the recommendations in your article and no doubt you have good reasons for your recommendations, but why should the purchaser act as a police officer in detecting the whys and wherefores of lost business for the manufacturer?

When a manufacturer quotes a price on his products I assume that the price is based on his manufacturing cost plus development or research and sales expense plus a legitimate profit. Therefore, when business is lost it can be assumed that the price quoted was out of line with other bidders. It is, therefore, the problem of this company to ascertain what is wrong within its organization. Information regarding the price paid to the successful bidder and the firm's name, as I see it, can be of no value to it.

Price cutting and price profiteering are as old as the ages. I believe they will always be with us, and their extent will be limited only by the law of supply and demand. However, I believe that the ethics of purchasing as a whole can be greatly improved by the elimination of trading after bids are received, and the seller can aid materially by refusing to adopt a trading attitude.

The manufacturer, in my opinion, is solely responsible for these trading or price-cutting tactics. I will venture that there is not a purchasing agent in the country who does not hear daily this remark from salesmen submitting bids: "If my prices are not in line, please give me a chance to revise them." This immediately gives the purchaser the idea that this particular bidder has not submitted prices to which the purchaser is justly entitled.

How much better it would be to all concerned if the seller would not request an opportunity to revise prices, and if such requests are made the purchaser should firmly state that no revisions would be accepted after bids were tabulated. The pursuance of such policies by seller and purchaser would put every one on an equal basis.

I might add that the purchasing policy as outlined above has been followed satisfactorily for many years by the two companies I represent as purchasing agent and I have yet to find a manufacturer who does not agree with us that it is equitable to all concerned.

F.

[The recommendation referred to was that where bidders are called back and asked to reduce the price the salesman should demand that he be shown the other bids as evidence that he is really high. "Firm bidding" has been urged, however, as the only effective cure for price cutting, a steadfast one-price policy, the business to be placed to the lowest figure on the original bids.—EDITOR.]

# Digest of Electrical Literature

## *Hydro-Electric Development and Steam Equipment*

*Combustion and Heat Transfer.*—R. T. HASLAM and H. E. HOTTEL.—The transmission of heat at moderate temperature levels is considered by the author to represent a fairly complete chapter in the subject of engineering design. This discussion endeavors to present a record of the present status of knowledge on heat transmission by radiation, including some recent developments in the theory of non-luminous gas radiation and some new ideas on radiation in powdered coal plants. A mathematical discussion is offered of the theoretical factors involved. The treatment covers radiation from suspended matter in powdered coal flames, from non-luminous gas, from luminous gas flames, between finite and solid surfaces, simultaneous radiation of gases and suspended solids, application of mechanisms described to furnace design and several methods for the solution of furnace problems. Emissivity of the flames due to suspended coal particles, to gas radiation and to the presence of solid carbons are covered also.—*Transactions of the American Society of Mechanical Engineers,* January-April, 1928.

*The Yokawa Automatic Hydro-Electric Power Station.*—U. VETSCH.—This hydro-electric generating station is a part of an extensive power supply scheme in Japan and may be started up or shut down by switching in or tripping the transmission line connecting it to the main power station. Periodic inspections are made, but other attention is unnecessary. The control arrangement by means of which the generator and switching operations may be performed and the provision for unusual conditions necessitating the automatic shutdown of the plant are given. External and internal disturbances have been fully allowed for in the planning of this station.—*Brown Boveri Review (Switzerland),* May, 1928.

*The Clinkering of Coal Ash as Related to Laboratory Fusibility Determinations.* — A. C. FIELDNER, W. A. SELVIG and P. NICHOLLS.—As the result of an investigation of 21 kinds of coal with fusion temperatures from 1,990 to 2,930 deg. F. and including determinations as to composition, distribution and fusibility of ash, conclusions regarding the clinkering characteristics of these coals were made by the authors. Float-and-sink tests were made with the coal, sulphur forms were determined, analyses of the ashes prepared and the results checked. It is concluded that the quantity of clinker formed decreases as the rate of combustion increases, although the density and fusion of the clinker pieces are greater at the higher rate. The rate of decrease in quantity with rate of burning becomes less when the coal ash and fusion temperatures are low. The quantity of clinker formation has a fairly definite relation to the softening temperature of the coal ash as determined by the standard gas furnace method. No distinct relation was found between the shortening of the flowing temperature interval and the formation of clinker scale.—*Transactions of the American Society of Mechanical Engineers,* January-April, 1928.

## *Generation, Control, Switching and Protection*

*Stress Analysis in Electrical Rotating Machinery.*—M. STONE.—The continuous trend toward larger and higher speed power generation units has, according to the author, required detailed attention to new design problems predominantly of a mechanical nature. Improvements in the knowledge of the behavior of the materials of construction and a more accurate estimation of stress conditions by detailed analysis have been accomplished in recent years. In this discussion the author has considered the methods available for stress analysis. The experimental lack of coincidence of the calculated critical speed and the observed vibration peaks is said to be affected by any flexibilities in the vibrating structure that are not properly evaluated, and the flexibility of bearings and bearing pedestals may be sufficient to lower the calculated critical speed by as much as 50 per cent.—*Sibley Journal of Engineering,* April, 1928.

## *Transmission, Substations and Distribution*

*Large Single-Phase Transformers.*—A. WINIGER.—The author offers a detailed description of the transformers used to step down the 132-kv., single-phase supply of the Swiss railways to 66 kv. At 16⅔ cycles the continuous rating of each transformer is 9,000 kva. at 0.75 power factor. A ten-minute overload with 13,000 kva. is permissible. The machines are of the two-legged circular coil type, with the 132-kv. winding next to the core and the 66-kv. winding with its five middle taps per leg on the outside. The laminations of the core are paper insulated, the legs have smooth ends for butt-joints with the extra heavy yokes, and the finished core is completely lacquered to avoid any action between the steel and the oil and to prevent rusting in the shops. Heavy nickel-steel press bolts hold the core structure together and extend on top to engage with the domed cover, making the entire active part of the transformer cover-suspended. The winding is made of multi-layer paper insulated copper strip, but to give the coils greater stability and to avoid shrinkage the wire insulation is impregnated with artificial resin. The end turns will stand line voltage for five seconds. The oval, all-welded tank is heavily reinforced to stand either an internal pressure of 28 lb. or a vacuum of ¼ in. mercury. The oil conservator is mounted on the tank, but is clear of the cover, making it possible to untank the transformer with a minimum of trouble. Some distance away from the tank is installed a large battery of tabular radiators, and a 4-kw. motor pump circulates the oil between transformer and cooler. — *Bulletin de l'Association Suisse des Electriciens,* April 22, 1928.

*Short-Circuit Risks on High-Tension Networks.*—J. BIERMANNS. — A theoretical consideration of the electrodynamic forces encountered in short-circuit conditions on high-tension networks has been offered by the author and supplemented by practical observations regarding such phenomena. The short-circuit forces on conductors, heating of conductors carrying the short-circuit current, oil circuit breaker stresses due to switching out a short circuit, devices utilized to limit the magnitude of the short-circuit current and similar pertinent factors have been considered.—*A.E.G. Progress,* April, 1928.

## *Units, Measurements and Instruments*

*Bridge for Measuring Small Time Intervals.*—J. HERMAN.—A bridge circuit for measuring time intervals from about one ten-thousandths of a second up to several seconds is described and its operation explained. The device is said to be fairly accurate and easy to operate and gives the results of measurements in fractions of a second directly. The operation consists merely of opening or closing a key repeatedly and securing a balance by observing a meter. The balance is secured by turning one or more dials which are calibrated in fractions of a second. Suggested applications include: Measuring the functioning times of electromagnetic switching arrangements; measuring propagation time at different frequencies; studying the operation of a machine with a view to improving its speed; maintaining proper adjustment of relays, cicruit breakers, etc., in power circuits; determine rate of acceleration of motors, and in psychological tests, the response of individuals to certain stimuli.—*Bell System Technical Journal,* April, 1928.

*Magnetic Leakage and Fringing Flux Calculations.*—WALTER L. UPSON and ERNEST L. FURTH.—The authors have endeavored to develop an empirical method for determining leakage and fringing fluxes in an electromagnetic

system. Certain assumptions are made in regard to the reluctance of the iron parts of the magnetic circuit and the leakage and fringing components of the flux following the paths of geometric shape. Formulas are derived for leakage and fringing fluxes as percentage of the main flux which crosses the gap from the pole face for two cases, that of a pole core of circular section and of one of rectangular section. Calculations of these fluxes in percentage of the main flux are given over a convenient range of gap lengths, coil lengths and distance of coil from pole face. It is demonstrated that both leakage and fringing depend to a considerable extent on all these factors. Calculations are made to determine the flux density at various points along the core length and these show a wide variation in density in accordance with the dimensions of the magnetic circuit. An experimental check was made of certain of the calculated results.—*Journal of the American Institute of Electrical Engineers,* May, 1928.

## *Electrophysics, Electrochemistry and Batteries*

*The Aluminum Electrolytic Condenser.*—H. O. SIEGMUND.—After outlining the development of the valve or polarizing effect of aluminum metal, when operated as an anode in certain electrolytes, the author discusses the operating characteristics of the aluminum condenser. There are two common conditions affecting the life of these devices that must be controlled, the chemical action of the electrolyte on the electrodes and the film, and the corrosion of the anodes. An ammonium borate solution having a specific resistance of 225 ohms per cubic-centimeter has proved to be satisfactory. The author has given consideration to the electrical qualities of films on aluminum, capacity of aluminum films, effect of impressed voltage on capacity, losses in aluminum cells and their effect on electrical impedance, commercial applications and designs of electrolytic condensers, the anode construction and material, the negative electrode, the prevention of contamination in manufacture and installation, the composition of the electrolyte, the relation between voltage of film formation and operating voltage, capacity and resistance characteristics, corrosion of condenser anodes, and the life of aluminum condensers. *Report of American Electrochemical Society,* April, 1928.

*The Effect of Trivalent Chromium and Iron on Chromic-Acid Chromium Plating Baths.*—R. SCHNEIDEWIND, S. F. URBAN and R. C. ADAMS, JR.—It has been found that the current efficiency of chromium deposition from chromic acid baths is a straight line function of the logarithm of the current density. The slope and position of this line are affected by the temperature and composition of the baths. In baths containing chromic acid and sulphate ion bright deposits are obtained on copper between limits corresponding to certain current efficiencies. In cases of other metals the range of current efficiencies yielding bright plate may be narrower than that for the baths mentioned. Heavy deposits on all metals are best obtained at 12 to 14 per cent current efficiency. Other things being equal, increasing the concentration of trivalent chromium and iron does not appreciably change the relationship of current density to current efficiency. However, the range of current densities producing bright plate is markedly contracted.—*Report of American Electrochemical Society,* April, 1928.

## *Traction*

*Locomotive with Vertical Motors.*—H. FURST.—The Austrian Federal Railways operate a novel type of express locomotive on their electrified valley lines, which has given unusually good performance. The new feature is that of individual motor drive for each axle by means of four vertical shaft motors, transmitting their power over spiral type bevel gears and special flexible couplings to the drivers. Each motor is rated 410 kw. at 855 r.p.m. and operates on 385 volts, 16⅔ cycles, giving the engine a top speed of 53 miles per hour. An oil-cooled transformer of 1,550 kva. output, 15,000 volts primary, with sixteen secondary voltage taps, is mounted midway between the solid frame of the locomotive. On each side of the transformer are arranged eight compressed-air-actuated contactors to regulate starting and running voltage without current interruption.—*Elektrotechnik und Maschinenbau,* April 8, 1928.

## *Telegraphy, Telephony, Radio and Signals*

*Grid Current Modulation.*—EUGENE PETERSON and CLYDE R. KEITH.—The term grid current modulator as used in this article refers to those vacuum tube circuits in which modulation is initially produced in the grid circuit of the three-electrode vacuum tube due to the non-linear grid-current grid-voltage relation. Comparison with a representative plate current modulator using the same tubes and the same plate potential shows that by modulating at maximum efficiency in the grid circuit and using the plate circuit solely for amplification the maximum power output is increased about eight times, the power efficiency is increased about five times and the ratio of sideband output to signal input is increased approximately three times. Under these conditions it is said that more carrier input power is needed for the grid than for the plate modulator. This improved performance has been made possible by a detailed study of the fundamental processes involved and by a design of the tubes and associated equipment such as transformers and filters to permit these fundamental processes to operate to their best advantage. The article concludes with an application of the fundamental principles involved to an experimental carrier telephone system in which the operating features of tubes, filters and transformers are discussed.—*Reprint B-292 Bell Telephone Laboratories, Inc.*

## *Miscellaneous*

*Pipe Bends Made by New Process.*—Production of short-radius pipe bends by a new and unusual process has recently been inaugurated by an American manufacturer. The bends are really short arcs of pipe made on a production basis in a standard series of sizes, and can be made of any bendable material in any thickness. It is stated that the manufacturers anticipate a definite series of bends of long and short radii to be capable of taking care of practically every requirement in the way of a fitting for welded piping. A standardized shape makes available to the consumer the advantages incident to mass production, including quick delivery, low cost and small inventory. The manufacturing process involves a furnace, special mandrels and a hydraulic press. The ram from the press travels over a long steel shaft, fixed into the stationary head of the hydraulic cylinder. Over this shaft a straight length of pipe is slipped until it strikes a flat ring fixed on the nose of the ram. After the straight pipe is placed on the shaft a horn-shaped mandrel is attached to the forward end of the shaft by a double-threaded turnbuckle coupling. The ram then moves the pipe onward until the forward end binds against the turn at the base of the mandrel. A gas furnace is used in this process to render the pipe plastic. The pipe is pushed over the mandrel as fast as it is hot enough to work. The design of the mandrel determines the curvature of the bend and the wall thickness, and variations from a straight bend to a wide coil are obtained by the location of the heat during the operation.—*Iron Age,* April 5, 1928.

*Tensile Properties of Soft Rubber Compounds.*—R. F. TENER, S. S. KINGSBURY and W. L. HOLT.—The results of tensile tests upon six rubber compounds when subjected to temperatures ranging from minus 70 deg. to plus 147 deg. C. are reported by the authors. These investigations indicate that temperature has a pronounced influence upon the tensile properties of the rubber. Within the lower limits rubber becomes rigid with an increased tensile strength, while at high temperatures it possesses practically no tensile strength whatever. This behavior was characteristic of all the specimens investigated. Differences due to compounding ingredients are, according to the authors, differences in degree rather than in kind. The magnitude of the changes in rubber compounds due to temperature shows that the effect of temperature should be given consideration in the design of rubber articles which are to be used at other than normal ranges.—*No. 364 Technologic Papers of the Bureau of Standards.*

# News of the Industry

## All in Readiness for the Big Atlantic City Convention

With hundreds of delegates from distant points already on their way and with the manufacturers' exhibition receiving its finishing touches, everything as the week closes points to a crowded and most successful convention of the National Electric Light Association at Atlantic City next week. Monday will be given over mainly to registration and greetings, with the reception to President and Mrs. H. T. Sands at 9 p.m. in the Million-Dollar Pier ballroom, followed by dancing. On Tuesday, Wednesday, Thursday and Friday mornings at 9.30 o'clock and Wednesday and Thursday afternoons at 2.30 the general sessions will be held on the Million-Dollar Pier. On Tuesday afternoon the four national sections meet—the Accounting at the Hotel Traymore, the Commercial at the Chalfonte-Haddon, the Engineering and Public Relations on the pier, while the public policy committee will have its open meeting on Wednesday evening at 8.30 in the ballroom, with music by B. A. Rolfe's orchestra and Richard Crooks, a well-known tenor.

The program of the business sessions was printed in the ELECTRICAL WORLD for May 19 (page 1031). Among the entertainment provided are included a ladies' card party on Tuesday afternoon at the Traymore, dancing on Tuesday and Thursday evenings, golf, croquet and dart throwing for "ladies' day" at the Seaview Golf Club grounds on Wednesday, and a special entertainment on Thursday evening in connection with the dances. Thursday afternoon has been left open.

The manufacturers' exhibition has increased in size from 41 participating companies in 1908 to 209 this year and from 3,650 sq.ft. to 81,082 sq.ft., with the size of displays limited and some manufacturers unable to get space.

News has been received at headquarters that Governor Dan Moody of Texas will not be able to make the announced address on "Decentralization of Industry."

## New York Water-Power Act Is Sustained

A decision handed down at Albany, N. Y., on Tuesday of this week by the Court of Appeals, the highest state tribunal, in Horton vs. the Public Service Commission and the Niagara, Lockport & Ontario Power Company, sustains the constitutionality of Section 624 of the state conservation law. This was a part of the original water-power legislation passed under the administration of Governor Nathan L. Miller in 1921 and in effect provides that a corporation organized for the production of heat, light or power owning the major portion of the head and volume of the usable flow of a stream and wishing to make a power development may acquire by eminent domain such additional property as may be needed to complete its project. This provision was held to favor large power companies at the expense of small ones.

The law was attacked on the ground that it was unconstitutional. The matter had been pending since 1924, at which time application was first made to the Public Service Commission to take advantage of the provisions of the law, and the decision is regarded as a most important one in utility circles.

With the Horton case disposed of, the Public Service Commission may now place upon its calendar and take testimony in the matter of the application of the Rochester Gas & Electric Corporation for a determination of the commission that certain property is necessary to the improvement and full development and utilization of petitioner's water-power site on the Genesee River in the city of Rochester, where the major part of the head and volume of the usable flow for power is now owned by the petitioner. This application, filed with the Public Service Commission a few weeks ago, had been held up pending the determination of the Court of Appeals in the Horton case, now made.

## Muscle Shoals Act in President's Hands

### "Pocket Veto" Expected at Washington—He Approves Resolution Forbidding Private Development at Gorge of Potomac Until Further Action by Congress

By PAUL WOOTON
Washington Correspondent of the ELECTRICAL WORLD

CONGRESS adjourned on Tuesday afternoon, May 29, with the Muscle Shoals bill still unsigned. As it was stated at the White House that the President was waiting for certain reports on the bill, it is assumed that he did not want to sign or to veto the measure until he had had an opportunity to study these recommendations. The general expectation in Washington on Thursday, as this dispatch is filed, is that he will not sign the bill.

The conference report was adopted by 43 to 34 in the Senate and by 211 to 146 in the House. Obstruction and filibustering in the Senate, led by Senator McKellar of Tennesse, whose determined opposition was based on the inclusion in the final draft of the bill of the provision for government construction of a dam at Cove Creek in his state, brought an all-night session. Mr. McKellar, who termed the Cove Creek clause "incomprehensible" and thought it would unfairly deprive Tennessee of rights and revenue, finally gave up, exhausted, and the bill was passed at 11.50 a.m. after the Senators who had absented themselves from the night sitting reappeared.

In this connection question has been raised as to the effectiveness of the so-called "pocket veto" at the close of a session of Congress. Some argue that failure to sign a bill delivered to the President less than ten days before adjournment of any but the last session of a Congress automatically makes it a law. No ruling on this question has been handed down by the Supreme Court, but a case involving it is now going through the legal machinery. The prevailing opinion, however, is that by any reasonable interpretation of the constitutional provision a bill left unsigned under such conditions at the end of a session dies just as certainly as does one left unsigned at the final session of a Congress. It is generally accepted that the President is privileged to sign a bill after adjournment. A notable example of the exercise of this power was had in the signing of the water-power act by President Wilson in 1920.

#### RESOLUTION ON THE POTOMAC

Among the bills signed by the President at the Capitol just before adjournment was the joint resolution directing the Federal Power Commission to issue no permit to any private interest for the development of water power on the Potomac in the Washington area until further action by Congress after considering reports that will be made by the National Capital Park and Planning Commission and the Federal Power Commission as to the best utilization of the gorge of the Potomac for the public benefit.

The President also signed at the Capitol the resolution providing for the striking of a medal commemorative of the achievements of Thomas A. Edison "in illuminating the path of progress through the development and application of inventions that have revolutionized civilization in the last century." Passage of the resolution was stopped in the Senate for a time by objections of

Senator La Follette. When assured that, before reporting the resolution favorably, the banking and currency committee had investigated claims that Mr. Edison had been given credit for inventions really made by others, the Wisconsin Senator withdrew his objection.

## Boulder Dam Bill Gets Preferred Status

*Will Be "Unfinished Business" When Congress Reassembles in December —Hot Fight in Senate—Resolution for Further Engineering Investigation Becames Law*

AFTER having provided the pyrotechnics which so frequently characterize the sessions of the Senate as adjournment approaches, the Boulder Dam bill failed of passage, but it remains the unfinished business of the Upper House. This agreement followed a filibuster precipitated by Senator Johnson's determination to reach a vote. In an all-night session starting on Monday the Arizona senators talked against the project, helped by other opponents. Excitement grew so high that the Senate finally went into executive session on Tuesday to calm down. Consideration of the measure—which was passed by the House on May 24 without a rollcall, a previous motion to recommit, made by Representative Douglas of Arizona, having been defeated by 219 to 139—will be resumed on the convening of the December session.

Senator Bruce of Maryland objected strenuously to the continuation of the Boulder Dam bill as the unfinished business. The Senator from California, he said, "did everything in his power to bring this bill—highly obnoxious to me and to other members of this body—to a vote. He failed and he should take the consequences of failure. I can see no reason why his bill should enjoy a privileged status at the beginning of the next session, only to be again an obstruction to other legislation, as it has been during the present session."

### Engineering Investigation Sure

Before the adjournment Congress passed and the President signed a joint resolution, introduced by Senator Pittman of Nevada, insuring a further engineering investigation of the project. This resolution reads as follows:

The Secretary of the Interior is hereby authorized and directed to appoint a board of five eminent engineers and geologists, at least one of whom shall be an engineer officer of the army on the active or retired list, to examine the proposed site of the dam to be constructed under the provisions of H.R. 5773, Seventieth Congress, first session [the Swing-Johnson bill], and review the plans and estimates made therefor and to advise him prior to Dec. 1, 1928, as to matters affecting the safety, the economic and engineering feasibility and adequacy of the proposed structure and incidental works, the compensation of said board to be fixed by him for each respectively, but not to exceed $50 per day and necessary traveling expenses, including a per diem of not to exceed $6, in lieu of subsistence, for each member of the board so employed for the time employed and actually engaged upon such work. Provided further that the work of construction shall not be commenced until plans therefor are approved by said special board of engineers. No authority hereby conferred on the Secretary of the Interior shall be exercised without the President's sanction and approval. The expense herein authorized shall be paid out of the reclamation fund established by the act of June 17, 1902.

## "Platform of American Industry for 1928"

A full meeting of the Platform of American Industry Committee was held in New York City recently under the auspices of the National Association of Manufacturers, of which John E. Edgerton is president. This committee formulated a platform for 1928 for submission to the Republican and Democratic national conventions in the same way that former platforms were submitted in 1920 and 1924. The platform indorsed for this year contains planks on agriculture, the Federal Reserve system, flood control, foreign trade policies, government and business, immigration, international relations, judiciary, merchant marine, private employment relations, regulation of combinations, reorganization of government departments, tariff, taxation, transportation, and women in industry. M. S. Sloan, president Brooklyn Edison Company, was a member of the drafting committee. Following is the paragraph on "government and business":

The function of our government is political—not economic. It was neither conceived nor fashioned to engage in competitive enterprise with its citizens, nor to administer the tasks of production and distribution, nor to substitute the judgment of its agents for that of responsible and experienced management in the direction of business operations. It is the servant and not the master of the citizen. It was established by him, under definitely limited authority, to protect and promote the pursuit of his chosen effort, assuring him security in the fruit of his endeavor, subject only to equal and impartial restraint essential to the maintenance of like opportunity and liberty for all.

We urge more reliance upon private energy and character and less upon public law and appropriations. The interdependence and complexity of modern life make necessary new limitations upon individual liberty, but these are justifiable only as they are demonstrated to be necessary and practically effective to accomplish their purpose. Self-government is self-support. To discourage initiative and lessen self-reliance destroys the dynamic force of the individual. Our government must rely upon the support of the citizen; the citizen must learn not to lean upon the government.

## New York Activities Delved Into

### Empire State's Utility Information Committee's Practices in the Promotion of Good Public Relations Investigated, as Are North Central Bureau's

WHEN the utility-industry investigation was resumed by the Federal Trade Commission on Monday, May 28, Fred W. Crone, director of the New York State Committee on Public Utility Information, took the stand and was examined on the public relations activities of that bureau. He testified that about $227,000 had been spent since 1922 for its purposes. Two booklets had been published purporting to state the attitude of the state's public utilities with respect to water-power development. One, entitled "Water Power in New York State," attained a circulation of 196,000 among newspapers, libraries, public officials, college professors, commercial and banking houses and civic organizations, Mr. Crone testified. The other, entitled "River Regulation in New York State," had a circulation of 40,000. These publications were frankly against power development by the state.

Pamphlets prepared by Mr. Crone and intended to present the case for privately owned utilities "in a matter-of-fact light" had been distributed to the number of 106,000 copies, 491 high schools being made the agencies for distribution. In a survey made by Mr. Crone for the educational committee of the National Electric Light Association, he described fourteen out of twenty-five books used in New York schools as, in his opinion, unfair to the utility companies. He favored liberal advertising by the companies in newspapers, but expressed indignation at the idea that the representatives of the industry designed in this way to insure the insertion of favorable reading matter.

C. H. B. Chapin, secretary of the Empire State Gas and Electric Association, gave testimony along similar lines. He said his association was in no way connected with the distribution of propaganda against the Boulder Dam project and declared that it had nothing to do with state legislation. Judge Healy asked Mr. Chapin if the purpose of publishing the pamphlets on state water power was to offset Governor Smith's theory of development of water-power resources. "That was partly the purpose," said Mr. Chapin.

On Tuesday John W. Lapham of Minneapolis, head of the North Central Public Utility Information Bureau, testified regarding the enlistment of the aid of University of Minnesota professors in rural electrification projects. A payment of $5,000 a year is made to the university. Payments of traveling expenses of college professors were also acknowledged. Mr. Lapham testified that his bureau spent from $15,000 to

$18,000 a year on its activities in Minnesota, North and South Dakota.

Telegrams subpœnaed from the files of the Postal Telegraph Company which were sent by Josiah T. Newcomb, counsel of the Joint Committee of National Utility Associations, to utility company heads and others interested in the committee's work contained nothing new or that invited suspicion of improper activities.

No session of the investigating body was held on Wednesday—Memorial Day. On Thursday morning Colorado public utilities men were to take the stand. There will be no hearings next week on account of the N.E.L.A. convention, which will be attended by persons who otherwise might be called as witnesses. It is expected that the hearings will be resumed the week of June 10.

## Operation at and Near Philadelphia Consolidated

Operations of the Philadelphia Electric Company, the Delaware County Electric Company and the Philadelphia Suburban-Counties Gas & Electric Company were to be consolidated June 1, President Taylor of the first-named company announced. The consolidation of operations does not constitute a merger nor does it entail any change in the financial status of the companies concerned. The purpose is to enable logical expansion of service in the Philadelphia metropolitan district and to give the communities served the advantages made possible through unified operation. In order to put the new plan into effect, the new territory has been divided into five major divisions as follows: Philadelphia and its various district offices; Delaware Division, headquarters at Chester; Main Line Division, headquarters at Ardmore; Schuylkill Division, headquarters at Norristown, and Eastern Division, headquarters at Jenkintown.

## New Jersey Public Service Rounds Quarter Century

Attainment of a quarter century of existence by the Public Service Corporation of New Jersey was to be celebrated on Friday evening, June 1, at the Robert Treat Hotel, Newark, by a banquet which was designed also to mark the completion of 25 years in service as head of the parent company and its subsidiaries by Thomas N. McCarter. Those who were to speak had not been announced as the ELECTRICAL WORLD went to press, but among the 600 guests expected were, in addition to the directors and officers of the companies, such prominent political, industrial and utility leaders as Senator Edwards and Governor Moore of New Jersey, E. T. Stotesbury, A. W. Thompson, O. D. Young, John B. Miller of Los Angeles and President J. F. Autenrieth of the New Jersey Board of Public Utility Commissioners.

## New Honor for Edison

*Gold Medal Awarded Him by Society of Arts and Sciences at Large Gathering Addressed by Public Utility Men and Educators*

IN RECOGNITION of his superservice to mankind, the Society of Arts and Sciences bestowed its gold medal for sciences upon Thomas A. Edison on Thursday, May 24. The presentation dinner was held in the Hotel Astor, New York City. Mr. Edison, who has not yet returned North from his Florida home, asked that his son, Charles Edison, might represent him, and the latter accepted

*Souvenir plaque of Edison dinner*

the medal on behalf of his father and read a letter of appreciation from the great inventor. Men and women prominent in educational, industrial, public utility and other fields gathered for the dinner to the number of six or seven hundred, a few among them, in addition to the speakers named below, being President James R. Angell of Yale University, President S. W. Stratton of the Massachusetts Institute of Technology, Dr. John H. Finley, Dr. Willis R. Whitney, and diplomatists and consuls-general from many foreign countries.

In making the presentation, President Walter Russell of the Society of Arts and Sciences paid a rhetorical tribute to Edison as a man as well as an inventor, dwelling on modesty and unselfishness as traits that endeared him to the fellow men for whom he had accomplished so much.

Dr. Frank B. Jewett, vice-president American Telephone & Telegraph Company, spoke of Mr. Edison as a great engineer whose imagination and skill have correlated the fragments of science and research for the purposes and benefits of mankind. Dean William F. Russell of Teachers' College, Columbia University, made mention of the debt that education owed this inventor who had increased the wealth of a nation, thus providing the economic bases on which schools can be supported. Dr. John Campbell Merriam, president Carnegie Institution of Washington, in considering the value of Mr. Edison's work, said that the world as transformed by machinery and science may not in the abstract be a better one, but that it is a more comfortable one in which to live and that life in it is more effective and satisfactory. Dr. Howard McClenahan, secretary of the Franklin Institute, expressed the feeling that Mr. Edison marked the passing of the earlier type of inventor—that of the great individualist—who is being replaced by great corporations and associations. Arthur Williams, vice-president New York Edison Company, recounted some intimate reminiscences of the early days of the career of the man honored. Prof. Karl T. Compton of Princeton University eulogized the medalist as a scientist, scouting invidious whisperings that he is "only an inventor."

Entertainment features of the evening followed closely the spirit of the occasion. Thomas Wilfred's color organ and Leon Theremin's "ether music" were among the numbers.

## New York & Queens Company Reduces Rates

Officials of the New York & Queens Electric Light & Power Company, serving Queens Borough in Greater New York with electricity, announced on Thursday morning a further reduction in the maximum rate to its consumers from 8½ to 8 cents per kilowatt-hour. The new rate will go into effect on July 1. This reduction, Vice-President H. L. Snyder said, will mean an annual saving to customers of approximately $700,000 and constitutes the fourth in a series of reductions in the past three years.

## Power Companies Aid New England Growth

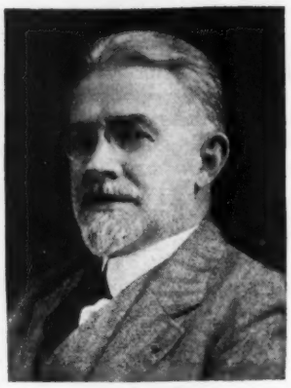
Nearly ninety power companies in New England have lately established industrial development departments and have assigned members of their organizations to carry forward the work of bringing industries into areas suited to their activities in the six Northeastern States. These departments are co-operating with the New England Council, local chambers of commerce, railroads and other organizations interested in promoting the growth of diversified industries in this territory. During the next few months the committee on industrial development of the power industry, which is co-operating with the council, will undertake a study of industrial surveys, their purposes and uses, and as a result it is expected that a standard form of industrial survey will be made available to electric service companies.

Another study is being made of the use and results of paid advertising by power companies throughout the country as a means of promoting industrial growth.

# Henry L. Doherty Sees "Nothing But Expansion"

A MESSAGE to the ELECTRICAL WORLD from Henry L. Doherty, head of Henry L. Doherty & Company and the Cities Service Company, sent from Battle Creek, Mich., where he is convalescing from his recent illness, strikes a note of firm faith in the future growth of the industry. Mr. Doherty says:

In my many years of experience in the central-station business I do not remember that there ever was a time when some one was not predicting that we had about reached the point of saturation for the use of electrical energy. In my earlier years, and especially when I was trying to induce all of the central stations to inaugurate intensive sales campaigns, I earned the reputation of being very visionary, because it was believed that my prophecies as to the amount of business we could develop were wildly optimistic. Since then I have lived to see all of the figures I had ever made look so small in comparison with actual results that the same people



*H. L. Doherty*

who once called me visionary would with these figures and actual results before them say that I was a piker. I know that we have not only not reached the saturation point for the use of electrical energy, but I know that we are not even approaching near to that point.

New uses for electrical energy keep springing up even faster than we can supply the need for the previously known uses. The investing public has been brought to the point where many of its members regard the securities of our electric supply companies as the most desirable form of investment, and I think we shall see more and more people turn to electrical securities and more and more of them regard them as the best possible type of investment. The wide distribution of our securities has been a most important factor in popularizing our companies, and this factor would alone justify our customer-ownership campaigns.

I am able to see nothing but expansion and still further expansion ahead of us. If you were to ask me what was the greatest asset the industry had I would tell you that I believe it is the trained men that conduct every branch of our business. I do not want to make any unpleasant comparisons, but if there is any industry that can rank with the electrical industry in this important particular, I don't know what it is.

## Purchases and Mergers

The Connecticut Power Company of New London will take over control of the Union Electric Light & Power Company of Unionville, Conn., through an exchange of stock. The territories served by the two companies are adjacent. The Union Electric Light & Power Company serves Avon, Canton, Burlington, New Hartford and Farmington, and its properties are valued at $1,750,000.

Petition for the purchase of the Genesee Valley Power Company of Fillmore, N. Y., has been filed with the New York State Public Service Commission by the Rochester Gas & Electric Corporation.

The transfer to the Annapolis & Chesapeake Bay Power Company of the Herald Harbor Lighting & Power Company and of the Severna Electric Company is announced. The purchasing company is a subsidiary to the Consolidated Gas, Electric Light & Power Company of Baltimore. The companies acquired are in Anne Arundel County. Approximately $10,000 was paid for the Severna Park company and about $4,650 for the Herald Harbor company.

Application to the Dauphin County Court by the Hummelstown (Pa.) Water & Power Company for permission to surrender its charter has been made. This is preliminary to a separation of the two departments of the company and the merging of the electric end with the Pennsylvania Power & Light Company.

The municipal electric lighting plant at Dahlgren, Ill., has been purchased by the Central Illinois Public Service Company, which will build a transmission line there.

The Union Power Company of Drumheller, Alberta, Canada, a subsidiary of the International Utilities Corporation, has acquired at a cost of $80,000 the plant at Three Hills which supplies electric light to Three Hills and Trochu.

The Islands Edison Company (formerly the Manila Gas Company) is about to acquire the entire capital stock of the Compañia Electrica de Santo Domingo, which furnishes light and power to the cities of Santo Domingo and San Pedro de Macoris in the Dominican Republic.

## Cooper Assails New York for Hydro-Electric Failure

Thirty millions of dollars annually is the cost to New York State of its failure to develop potential water powers, Colonel Hugh L. Cooper, engineer and authority on hydro-electric development, asserted in an address delivered at the annual meeting of Associated Industries of New York State at Syracuse on May 25.

Mr. Cooper, who designed and now is engaged in constructing an eight-million-dollar hydro-electric plant on the Dneiper River, in the Ukraine, for the Soviet government, criticised the business men of the state "for their indifference and their failure" to develop the three million available horsepower which he said is now being wasted. Such development, he declared, would cost $570,000,000, "but such an investment would support a new and existing industrial development of approximately three and a half billions of dollars in New York State. "Within the last three years," said Mr. Cooper, "new industries that would have used more than 400,000 hp. have knocked at your doors for cheap energy and have been denied."

Mr. Cooper characterized inability to decide whether to develop the state's water powers by government or by private agencies as "a miserable admission of lack of intelligence." He then reviewed the history of governmental development and control of water power, citing specific examples to prove that private development and control provided cheaper power. "Because of the procrastination in the State of New York that has prevailed in the last ten years," he said, "the St. Lawrence is in actual danger at this time of being developed in a manner and according to plans that are far from being in the interest of the people of the state."

## Thousands View Illumination of Great Shoshone Falls

A crowd of automobilists and others estimated at ten thousand persons witnessed on May 24 the illumination of the Great Shoshone Falls, on the Snake River in southern Idaho, by 30 floodlamps with a total rating of 25,000,000 cp. The lighting system was installed on a shelf in the canyon. The spectacle lasted from 9 o'clock until midnight, with alternate flashes of rainbow hues and colored squares upon the foaming water and the lava rock walls of the canyon.

W. R. Putnam, Boise, vice-president and general manager of the Idaho Power Company, told of his company's plans to make Shoshone Falls as great a natural attraction for the West as Niagara is for the East. The lighting is to continue every night from dusk until midnight. the colored illumination being used on special occasions.

# Denver A.I.E.E. Convention Promises Well

*Well-Varied Program of Technical Papers and Discussions—One Day to Be Spent in Exploring Mountain Parks—Yellowstone Trip*

SURGE-VOLTAGE investigations on transmission lines, control and protection of feeders for electrified railways, alternating-current elevator motors, electric welding of pipe lines, telephony, transmission experiences, extinction of alternating-current arcs, high-frequency supervisory control and geophysical prospecting are the main topics that will be treated in the papers and discussions at the summer convention of the American Institute of Electrical Engineers at Denver. This convention is to be held from June 25 to June 29, and headquarters will be at the Cosmopolitan Hotel.

The annual dinner-dance will be held on Wednesday evening. Attractive journeys arranged, in addition to the customary sport and recreation, include an all-day trip through Denver's mountain parks and the Bear Creek Canyon and a tour of Yellowstone Park. The former will occupy the morning and afternoon of Thursday, June 28, and be followed by a theater party in the evening. The latter will start immediately after the convention closes. Tuesday and Friday afternoons will be devoted to golf and tennis tournaments. The tentative technical program follows:

MONDAY, JUNE 25

Registration, section delegates' and branch delegates' meetings.

TUESDAY, JUNE 26

*Morning.*—President's address; session A, Surge-Voltage Investigations: "Surge-Voltage Investigation on Transmission Lines," W. W. Lewis, General Electric Company; "Lightning Investigations on New England Power Company's System," E. W. Dillard, New England Power Company; "Surge-Voltage Investigation on 140-Kv. System of Consumers Power Company," J. G. Hemstreet and J. R. Eaton, Consumers Power Company; "Surge-Voltage Investigation on 132-Kv. Transmission Lines of American Gas & Electric Company," Philip Sporn, American Gas & Electric Company; "Surge-Voltage Investigation on 220-Kv. System of Pennsylvania Power & Light Company," N. N. Smeloff, Pennsylvania Power & Light Company.

*Evening.*—Lecture, "Geophysical Methods of Prospecting," Dr. C. A. Heiland, Colorado School of Mines.

WEDNESDAY, JUNE 27

*Morning.*—Sessions B and C, technical committee reports (two simultaneous sessions).

*Afternoon.*—Session D, Electrified Railways, Feeder Control: "High-Speed Circuit Breakers," J. W. McNairy, General Electric Company; "High-Speed Circuit Breakers for Railway Electrification," H. M. Wilcox, Westinghouse Electric & Manufacturing Company; "Operating Experience with High-Speed Circuit Breakers," B. F. Bardo, New York, New Haven & Hartford Railroad; "Arrangement of Feeders and Equipment for Electrified Railways," R. B. Morton, of Gibbs & Hill; "Protection of Electric Locomotives and Cars to Operate with High-Speed Circuit Breakers," E. H. Brown, Pennsylvania Railroad; "High-Speed Circuit Breaker in Railway Service," W. P. Monroe and R. M. Allen, Illinois Central Railroad.

FRIDAY, JUNE 29

*Morning.*—Sessions E and F (two simultaneous sessions). Session E: "A Formula for Minimum Horizontal Spacing of Transmission-Line Conductors," P. H. Thomas, consulting engineer; "Transmission Experience of the Public Service Company of Colorado," M. S. Coover, University of Colorado, and W. D. Hardaway, Public Service Company of Colorado; "Alternating-Current Elevator Motors of the Squirrel-Cage Type," E. E. Dreese, Lincoln Electric Company; "Electric Welding of Pipe Lines," J. D. Wright, General Electric Company. Session F: "Utilization of Lodge-Pole Pine as Pole Timber," R. W. Lindsay, Mountain States Telephone & Telegraph Company; "Carrier Systems on Long-Distance Telephone Lines," H. A. Affel and C. S. Demarest, American Telephone & Telegraph Company, and C. W. Green, Bell Telephone Laboratories; "Superimposed High-Frequency Currents for Circuit-Breaker Control," L. R. Ludwig, Westinghouse Electric & Manufacturing Company; "Extinction of an Alternating-Current Arc," Joseph Slepian, Westinghouse Electric & Manufacturing Company.

## American Papers for Tokyo Congress Discussed

Adequate presentation of America's engineering and industrial story at the sessions of the World Engineering Congress to be held in Tokyo next year was discussed at a meeting of the executive committee of the American general committee for the congress held in New York on May 18. Hospitality to be extended in the United States to European delegates in their movement from the Atlantic to the Pacific on the way to the Tokyo congress was another subject which came up at the meeting. The entertainment committee reported that local engineering societies already have volunteered their services as hosts to the delegates from Europe.

The importance of careful selection of papers which will collectively reflect the status and tendencies of each of the major branches of engineering in this country, rather than cover unrelated miscellaneous topics, was stressed in the report of the technical program committee, headed by Prof. Dugald C. Jackson, who announced the following as members, with himself, of the technical program committee: Allen Hazen, vice-chairman; H. Foster Bain, Alex Dow, W. F. Durand, J. R. Freeman, Bancroft Gherardi, George W. Fuller, F. L. Hutchinson, Major General Edgar Jadwin, Dean Dexter S. Kimball of Cornell, A. D. Little, Fred R. Low, O. C. Merrill, Prof. Michael I. Pupin, Calvin W. Rice, George T. Seabury, George Otis Smith and W. E. Wickenden.

## Stratton Doubts Wisdom of Exporting Maine Power

Remarks made by President S. W. Stratton of the Massachusetts Institute of Technology at an industrial conference held recently in Maine have encouraged the opponents of the exportation of surplus hydro-electric energy. As reported, Dr. Stratton said: "The restriction that confines the use of water power to Maine may be a blessing to the state in the long run. Wherever water power has been long developed it has proved advantageous to bring manufacturers close to the power." He went on to cite aluminum manufacture at Niagara Falls as a parallel instance and drew the conclusion that "these new water-power plants of Maine will in time become veritable gold mines."

An Augusta report says that as a result of President Stratton's remarks it is believed there that the chances that the Legislature will lift the power ban are not so favorable as they would have been if his views had coincided with those of many other engineers. Governor Ralph Brewster, who is seeking Senator Frederick Hale's seat in the United States Senate, has during his two terms in office opposed strongly the lifting of the ban against the exportation of power. William Tudor Gardiner, who will possibly be the Republican candidate for Governor, believes that the matter should be settled by a referendum vote. He is said to be more favorable to the power interests as far as exportation goes than any of the other candidates.

Although the platform of the state Democratic party declares for exportation of power, conditioned with certain safeguards for the home consumers, Edward C. Moran, Jr., who will be the Democratic candidate for Governor, declared in Portland that he does not favor exportation of surplus hydro-electric power and is opposed to any legislation which would permit such traffic.

## Progress Toward International Technical Co-ordination

A recent notification from the central office in London of the International Electrotechnical Commission concerning the co-ordination of international technical meetings, in accordance with the movement initiated in Italy last September, says:

In January of this year a first meeting of the unofficial "comité d'entente," as it was suggested it should be called, was held in London at the offices of the I.E.C., when representatives were present from the International Illumination Commission, World Power Conference, International Consultative Committee on Long-Distance Telephony, International Union of Producers and Distributors of Electrical Energy, International Standards Association (in process of formation) and the International Electrotechnical Commission. Prof. Clarence Feldmann of Holland, the new president of the I.E.C., was in the chair, and an interesting exchange of information took place regarding dates of future meetings and in one or two cases on the preliminary programs. It was felt that if information of such a character regarding dates and programs could be exchanged at infrequent intervals, say once annually, it would be bound gradually to lead to most helpful co-operation and be of advantage to the delegates attending the many international meetings as well as probably to enhance the value and usefulness of the meetings themselves.

The question of co-operation between international organizations by joint international committees as well as by observers was also touched upon. Finally it was decided to keep the unofficial committee in being, with the I.E.C. as convener, and to call another meeting a year hence by which time the various organizations represented would have had time to give their official decision—which in most cases, it is anticipated, will be favorable—regarding the permanent establishment of such a committee. It is also hoped that other international organizations in the technical field will be interested in this co-operative idea, which, while leaving each

organization entirely free, yet provides a kind of clearing house through which information may be exchanged and administrative matters discussed in a free and friendly manner.

## Radio Corporation Accused by Trade Commission

Charges that the Radio Corporation of America has violated the laws against "unlawful restraints and monopolies" were made by the Federal Trade Commission on May 23, and July 23 was fixed as the date for a hearing at Washington. The charges are directed against a "license agreement" made by the Radio Corporation with about twenty-five of the principal manufacturers of radio receiving sets, representing approximately 95 per cent of production, under which agreement a three-element vacuum tube essential to the sets must be purchased from the Radio Corporation, no opportunity for competition by other tube manufacturers being allowed. These tubes were formerly protected by General Electric, Westinghouse and American Telephone & Telegraph patents, but since the expiration of these patents in 1924 and 1925 their manufacture has been open to any one. The Radio Corporation is the exclusive distributor for receiving sets and vacuum tubes made by the General Electric and Westinghouse companies.

## Upper Rio Grande Exploration Shows Possibilities

Co-operating with and accompanying several members of the joint commission of water conservation and power possibilities of the Rio Grande, the Texas State Board of Water Engineers, with ten engineers and other irrigation and hydro-electric experts, has just completed a tour of the international boundary stream along its remote upper course. At points in the Big Bend region, 80 to 100 miles from the nearest railroad point, they selected sites for three dams which would impound a total of approximately 10,000,000 acre-feet of water and provide energy for generating an enormous supply of hydro-electric power.

C. S. Clark, chairman of the Board of Water Engineers, stated that by constructing a dam 250 ft. high across Boquillas Canyon 4,000,000 acre-feet of water would be impounded. Similar dams in Mariscal Canyon and Santa Helena Canyon would impound an additional 6,000,000 acre-feet of water, Mr. Clark said. The constructing of these dams would insure a permanent water supply for irrigating vast areas of rich lands on the American and Mexican sides of the Rio Grande and would enable the generation of electric power for supplying towns and industries for three hundred miles around. As a result of the investigations and surveys, a report favorable to the carrying out of the projects will be made to the United States and Mexican governments.

# Briefer News

ANOTHER CALIFORNIA UTILITY TO REDUCE RATES—The Coast Counties Gas & Electric Company, with headquarters at Santa Cruz, Calif., has asked the California Railroad Commission for authority to reduce its rates for electric service and place them on a parity with rates of the Pacific Gas & Electric and Great Western Power companies in the same general territory.

PHILADELPHIA ALSO PLANS AN INDUSTRIAL MUSEUM.—The Franklin Institute has $1,900,000 available toward the fund needed for building a great museum of industry and physical science on the Philadelphia Parkway and is "confidently expecting to build it," Dr. Howard McClenahan, secretary of the institute, told the Philadelphia Engineers' Club last week. No such museum as yet exists in the United States, Dr. McClenahan said, but New York, Chicago and Detroit have funds available and are expecting to build such museums in the near future. He described the museums of this type in London, Paris, Munich and Vienna.

## *Coming Meetings*

**[A complete directory of electrical associations, with their secretaries, is published in the first issue of every volume. For latest list see ELECTRICAL WORLD for Jan. 7, page 80.]**

**National Electric Light Association**—Atlantic City, June 4-8. P. S. Clapp, 420 Lexington Ave., New York.

**American Association of Engineers**—Hotel Hussman, El Paso, Tex., June 4-6. M. E. McIver, 63 E. Adams St., Chicago.

**National Electrical Manufacturers' Association**—Radio Division, Chicago, June 4-7.

**Electrical Supply Jobbers' Association**—The Homestead, Hot Springs, Va., June 5-8. E. Donald Tolles, 165 Broadway, New York.

**National Electrical Manufacturers' Association**—The Homestead, Hot Springs, Va., June 11-15. S. N. Clarkson, 420 Lexington Ave., New York.

**Artistic Lighting Equipment Association**—Hotel Sherman, Chicago, June 11-16. G. P. Rogers, 420 Lexington Ave., New York.

**Pacific Coast Division, N.E.L.A.**—Hotel Huntington, Pasadena, Cal., June 12-15. S. H. Taylor, 447 Sutter St., San Francisco.

**Georgia Electrical Association**—Savannah, June 14 and 15. J. J. McDonough, Georgia Power Co., Dublin, Ga.

**Northwest Division, N.E.L.A.**—Portland, Ore., June 19-22. B. Snow, 1208 Spalding Bldg., Portland, Ore.

**Canadian Electrical Association**—SS. "Richelieu" from Montreal to Saguenay and return, June 20-23. H. M. Lyster, 712 Power Bldg., Montreal.

**American Institute of Electrical Engineers**—Cosmopolitan Hotel, Denver, June 25-29. F. L. Hutchinson, 33 West 39th St., New York.

**Association of Iron and Steel Electrical Engineers**—Hotel Stevens, Chicago, June 25-28. J. F. Kelly, Empire Bldg., Pittsburgh.

**American Society for Testing Materials**—Chalfonte-Haddon Hall, Atlantic City, N. J., June 25-29. C. L. Warwick, 1315 Spruce Street, Philadelphia.

**Public Utilities Advertising Association**—Detroit, July 8-12. T. P. Pfeiffer, Byllesby Engineering & Management Corp., Chicago.

**East Central Division, N.E.L.A.**—Cedar Point, Ohio, July 10-13. D. L. Gaskill, Greenville, Ohio.

**National Electric Credit Association**—Boston, July 16 and 17. F. P. Vose, 1008 Marquette Bldg., Chicago.

**Wisconsin Utilities Association, Electric Section**—Appleton, Wis., July 26 and 27. J. N. Cadby, 432 Broadway, Milwaukee.

ROCHESTER (N. Y.) GAS & ELECTRIC'S TWENTY-SEVENTH SUBSTATION.—Land for a new substation, the twenty-seventh in the Rochester Gas & Electric Corporation's chain within the city limits, has been acquired in the southeast section of Rochester. This station will be completed in another year. It is designed to provide for a rapidly growing residential section.

NEW UNIT FOR DUBUQUE, IOWA.—Extensions and improvements are being made at the Dubuque plant of the Interstate Power Company which will increase its capacity to more than three times that of three years ago. The work includes the installation of a 15,000-kw. generating unit with its accessories and of a larger water-pumping system and the building of additional transmission lines. The extensions are expected to be completed in a few months.

GAS-ELECTRIC CARS TO REPLACE STEAM LOCOMOTIVES ON A MOBILE & OHIO DIVISION.—Plans for the replacement of steam locomotives by gas-electric-operated trains in the passenger service on its 181-mile Montgomery-Artesia division have been announced by the Mobile & Ohio Railroad. The new trains consist of two coaches, one a combination car and the other a standard passenger coach of the type built for the gas-electric railroad service. Steam trains will continue to be operated for freight service.

NEW HYDRO PLANT FOR PHILIPPINES SUGGESTED.—A trip over the southern islands in the Philippines by Vice-President L. P. Hammond of the Electric Bond & Share Company, New York, to determine economic possibilities there is understood to have led to a report that the Agos Falls, on the Agos River in Lanao, Mindinao, could be utilized to supply all the power needed in that territory for a long time to come. The falls have a drop of 2,300 ft. and are capable of generating about 32,000 hp., but a market is lacking.

RICHMOND TO TAKE OVER WATER-POWER RIGHTS ON THE CHESAPEAKE & OHIO CANAL.—An agreement with the Virginia Electric & Power Company whereby the city of Richmond and the company can exchange power for five years on a new price basis has been reached in connection with negotiations by the city for water rights on the Chesapeake & Ohio Canal. The proposed contract provides that the city may take over all the water-power rights of the power company on the Haxall Canal, provides for a power exchange contract with a five-year term

and new exchange prices and clears the way for the city's use of 88 cu.ft. of canal water per second for power as well as for water supply. Agreements whereby the city will take over the Atlantic Coast Line Railway's water rights on the Chesapeake & Ohio Canal have also been reached. Both these agreements must be confirmed by the City Council.

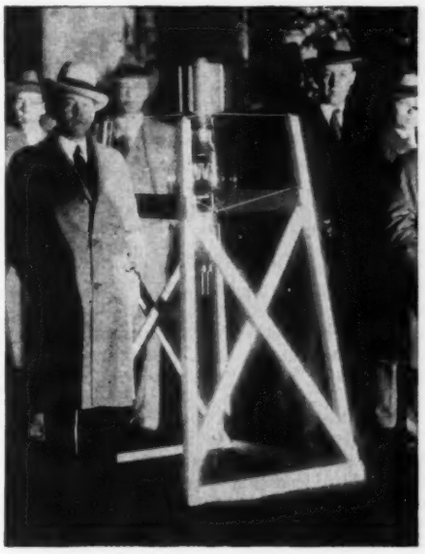
MOUTH-OF-MINE PLANT IN SASKATCHEWAN. — Work will commence soon on the first unit of the Montreal Engineering Company's plant to generate electrical energy at the mouth of the coal mines in the Canadian province of Saskatchewan. The plant as designed will eventually cost $750,000, but for the present a third of that sum will be spent on building, machinery and equipment. The plant will be located between Bienfait and Estevan, and the company will distribute power wherever economic distribution will permit.

PLAN FOR GOVERNMENT HYDRAULIC LABORATORY LOSES.—Not only did the rivers and harbors committee of the House of Representatives refuse to approve the bill passed by the Senate authorizing the establishment of a hydraulic laboratory in the Bureau of Standards, but it also refused to approve the bill with an amendment which would permit the Corps of Engineers to establish its own hydraulic laboratories at river sites. As there were only four votes in the committee for the bill as amended, it is apparent that no further progress can be made with it unless a change of reference is obtained next session.

EMPIRE DISTRICT ELECTRIC COMPANY PREPARES TO BUILD TABLE ROCK DAM. —The Empire District Electric Company of Joplin, Mo., has filed an application with the Missouri Public Service Commission for a certificate of convenience and necessity to construct and operate its long-projected hydro-electric power plant and dam at Table Rock in Taney County on the White River. The dam will be 1,924 ft. long and 197 ft. above bedrock and will be able to furnish power for four 37,000-kw. generators and have an ultimate annual production energy of 410,000,000 kw.-hr. Cost of the project will be $16,700,000 when it is finally completed, according to estimates. The company has a preliminary permit from the Federal Power Commission and has applied for the final license.

OHIO UTILITIES TO PROVIDE WORK FOR TEN THOUSAND MEN. — Public utility companies in Ohio will provide employment for approximately ten thousand men on new construction projects in 1928, according to announcement by the Ohio Committee on Public Utility Information. In addition to very large telephone undertakings, the Cleveland Illuminating Company will employ 1,100 men on the erection of two 132-kv. power lines, at an estimated cost of $11,500,000; the Dayton Power & Light Company will need 450 men in completing construction work estimated to cost $2,500,000, and the Union Gas & Electric Company will use 600 men in work to cost $7,800,000. Other light and power utilities planning expenditures are: Toledo Edison Company, $2,250,000; Ohio Public Service Company, $2,000,000; Ohio Edison Company, $270,575; Columbus, Delaware & Marion Electric Company, $235,000, and Southern Ohio Public Service Company, $260,000.

NELA PARK CELEBRATES MANUFACTURE OF 50,000-WATT LAMP.—The first public showing of the new 50,000-watt incandescent lamp constructed by engineers of the General Electric Company was held at Nela Park in Cleveland a week or two ago, and many citizens



gathered to see it. A 30,000-watt lamp furnished the necessary light for the photograph, which was taken outdoors during a blinding rain. The new lamp is of the gas-filled tungsten-filament type, with a tall chimney-like extension of the bulb equipped with radiating disks.

CANADIAN SUPREME COURT DEFERS ARGUMENT ON PROVINCIAL POWER RIGHTS. — According to a decision handed down by the Chief Justice of the Supreme Court of Canada, the argument between the Dominion government and the provinces on questions respecting power and property rights on navigable streams will not be heard until September. The issue was to have been joined on June 28. The seven questions submitted to the Supreme Court by the Dominion government were criticised by Eugene Lafleur, counsel for the province of Quebec, when he appeared before the court on May 21 to urge the postponement of the hearing. The questions were so general and so abstract, he said, that it was imposible to forecast what the real issues were going to be. They should be in some concrete form, but as they stood they could not be intelligently answered by any court. Mr. Lafleur said he had the support of British Columbia and Manitoba in his contention.

EEL RIVER HYDRO SITE SOUGHT.—An application for permission to divert 137,385 acre-feet and 189 sec.-ft. of water from the North Fork of the Eel River near Mina, Mendocino County, for power and domestic purposes, was filed with the California State Division of Water Rights on May 16 by Frederick C. Rockwell of Carmel, Calif. The project will produce 24,431 hp. and will cost approximately $1,500,000, he says. Construction is to begin six months after the permit is issued, and the project will be completed within three years.

MOVEMENT FOR STATE OWNERSHIP OF HYDRO RESOURCES IN OREGON GAINS NO MOMENTUM.—No further actions have been taken by the Oregon Berry Growers' Association in connection with a resolution adopted last March which had for its purpose the launching of a campaign in behalf of state ownership and operation of hydro-electric utilities. This association proposed to circulate an initiative petition for public ownership and the development of natural resources by the state, but no such measure will appear on the May ballot, nor are there any developments to indicate that an amendment of the kind will be submitted to the electorate next November despite the organization's March resolution.

SHAWINIGAN COMPANY GETS ST. MAURICE RAPIDS SITES.—At a public auction conducted by the Quebec government on May 23 the Shawinigan Water & Power Company, as predicted last week, obtained the rights of developing a series of rapids on the St. Maurice River, which it has been estimated will mean an additional possible supply of power for that company reaching more than 500,000 hp. Shawinigan was the only bidder, and its bid of $5 over the upset price of $25,000 resulted in the company obtaining the lease. Preliminary investigation by the Quebec Streams Commission has shown that there are three principal sites for the construction of dams—Blanc Rapids, 172,000 hp.; Allard Rapids, 50,000 hp.; Secours Rapids, 85,000 hp. The company must start construction not later than July 1, 1930, and is also under obligation to have 100,000 hp. developed by July, 1933, expending in the undertaking at least $10,000,000.

AYLESWORTH SEES BRIGHT FUTURE FOR RADIO.—Progress and possibilities of future development of radio broadcasting, radio and the electrical industry were described and outlined by M. H. Aylesworth, president of the National Broadcasting Company, in an address before the seventh quarterly luncheon of the Electric Association at the Palmer House, Chicago, May 24, at which more than six hundred representatives of the various divisions of the electrical industry were present. There

are twelve million radio sets in the United States, two million of which, said Mr. Aylesworth, are small crystal sets and useful only for local reception. Several million sets will soon be replaced with modern equipment. He declared that the electrical industry has in radio an opportunity to render an outstanding public service in placing in the homes of all of the American people an indispensable equipment within the reach of rich and poor alike.

WEST TEXAS SERVICE STILL EXPANDING.—A new 8,500-hp. gas-burning generating unit at San Angelo, Tex., has begun serving customers of the West Texas Utilities Company. The distribution system at San Angelo was changed over from 2,300 volts to 4,150 volts, increasing the capacity of the system threefold. This change was made necessary by the phenomenal growth of San Angelo as a result of oil development. The new unit will supply all the needs of drilling and producing companies, refineries and pipe lines for electric power. It is the second to be built at San Angelo within the past year.

UTILITY COMPANY AND INDIANA TAX COMMISSION $7,300,000 APART ON VALUATION. — For the Indianapolis Power & Light Company a tax valuation of $24,592,530 has been fixed for 1928, by action of the Indiana Board of Tax Commissioners, or an increase of $984,930 above the valuation for 1927. Harley L. Clarke, chairman of the company's board, a few days before had asked the commissioners for a reduction of $6,400,000. An opportunity to appeal from the board's appraisement will occur. An increase of $4,033,970 over the 1927 taxation valuation of the gas and electric properties of the Interstate Public Service Company of Indianapolis has also been made, bringing the total assessment of the company to about $25,000,000.

IOWA HYDRO-ELECTRIC PROJECTS.—The Cedar River water-power plant of the Iowa Public Service Company at Charles City, Iowa, will be rebuilt and improvements made at a cost of $100,000, according to Don Sterns, president. Contracts are to be let this month and the work completed by Nov. 1. The expansion of the Charles City power unit is designed to make commercial consumers in the territory independent of the Waterloo high-tension line.——The Central States Electric Company, which will complete a power dam at Iowa Falls, Iowa, within the next three months and has a petition before the Iowa Railroad Commission for authority to build a hydro-electric plant near Dolliver Park, Fort Dodge, Iowa, is contemplating an extensive power distribution program in the industrial region about Fort Dodge, its officers say. As a first step in this program petition has been filed with the state commission for authority to construct transmission lines in the Fort Dodge area to connect, eventually, with the proposed Dolliver Park dam.

# Commission Rulings

ALLOCATION OF CUSTOMER COSTS. — In adjudicating proposed rate changes for the St. Joseph Gas Company, the Missouri Public Service Commission held that a rate structure theory claiming to give consideration to the rates charged the large consumers in order to increase sales and then proceeding to justify a proposed increase to 57 per cent of the small consumers by the use of an allocation of costs made upon the theory that all consumers may be taken as one class, the smaller class, is inconsistent and unfair.

LEASED PROPERTY NOT A PROPER ITEM FOR INCLUSION IN RATE-FIXING VALUATION.—Leased property, the Oregon Public Service Commission holds, is not a subject for consideration in the determination of a valuation of an electric utility for rate-making purposes. This decision was rendered in connection with the investigation of the valuation of properties owned by the People's West Coast Hydro-Electric Corporation, and the commission says: "The utility claims that the land which is leased, including the right to use water . . . and land upon which is located the substation and general office, . . . should be valued upon the same basis as property owned. The leases are for a limited term and the titles are held by others than the operating company. The lessee pays a rental which is included in operating expenses in accordance with the 'uniform classification of accounts' prescribed by this commission."

ARIZONA CORPORATION COMMISSION TAKES JURISDICTION OVER HYDRO-ELECTRIC CORPORATIONS.—Declaring that "the bestowing of legal rights and privileges and franchises authorizing the operation by public service corporations of natural water powers situate within the state, by means of certificates of public convenience and necessity, which may not be obtained elsewhere or otherwise, is the only manner in which the commission, in the exercise of its full powers to safeguard the rights of the state and fully protect its people, may impose the restrictions and limitations contemplated by the state constitution and the pursuant statute," the Arizona Corporation Commission has issued an order requiring all corporations engaged in hydro-electric development to obtain a certificate of convenience and necessity before engaging in such activity within the State of Arizona and assuming full jurisdiction, subject only to the limited sovereign powers of the federal government.

RIGHTS AND OBLIGATIONS OF FRANCHISE CANNOT BE SEPARATED.—The Wisconsin Railroad Commission, rehearing a case in which the obligation of the Eagle River Light and Water Commission to give electric service to the town of Cloverland was concerned, because of new evidence brought out at an action in the County Court to set aside its decision, this evidence conflicting with the original evidence before the commission, reaffirmed its first decision, saying: "The franchise granted by the town of Cloverland to the village of Eagle River clearly gives the village of Eagle River an exclusive permit to operate in that town and includes the indeterminate permit defined by the statutes and with it the obligation to serve the public in that town. As stated in our former decision: 'The public utility cannot accept only such parts of the franchise as convey rights without assuming the obligations imposed by other parts of the same instrument. . . . It is neither equitable nor was it within the contemplation of the parties to the franchise that the grantee might segregate its parts and exercise rights under only a portion of it. By such exercise the utility must be deemed to have accepted the entire franchise with its burdens as well as its benefits.'"

# Recent Court Decisions

COMPANY HOLDING CITY FRANCHISE CANNOT REFUSE SERVICE TO OUTLYING CUSTOMER ON GROUND OF EXPENSE.—Confirming the trial court in Brown vs. Arkansas-Missouri Power Company, the Supreme Court of Arkansas has decreed that damages were properly awarded to the plaintiff because of the refusal of the company to serve him with electricity on the ground that the remote situation of his filling station would make doing so too expensive. The building in question was in the city of Pocahontas, south of the Black River, the improvements in the city being virtually all north of the river and a mile distant. The court held that the franchise accepted by the company made it compulsory to serve the applicant, regardless of loss, and the fact that since the judgment was rendered the territory in question had been detached from the city by the alteration of the latter's boundaries did not nullify the obligation assumed under former conditions so as to invalidate the award of damages, whatever the determination as to an existing obligation to serve—on which the court did not pass—might be. (4 S. W. [2d] 15.)*

CONTRIBUTORY NEGLIGENCE OF CHILDREN A QUESTION FOR JURY.—Affirming judgment for the defendant in Wallace vs. Great Western Power Company, a damage suit brought because of the death of a twelve-year-old boy who climbed 33 ft. on an electric tower and received a fatal shock from high-voltage wires, the Supreme Court of California said that the question of contributory negligence is generally one of fact for the jury and that this principle applies in the case of children. None the less, the appellate court refused to upset the granting by the trial court of a motion for nonsuit, saying: "Assuming the defendant herein to have been guilty of negligence in the maintenance of this electric tower in an open and unguarded state within the limits or vicinity of a populous city [Oakland] and without the presence of signs or devices which would give warning to persons who might be tempted to play upon or ascend the tower, the trial court was still in a position, upon motion for nonsuit, to determine from all of the circumstances of the case whether the deceased boy, though a minor, was sufficiently intelligent and sufficiently familiar with the dangers incident to contact with high-power electric lines that his action in ascending this tower by the difficult means of ascent afforded, and to the height and place of danger to which he did thus succeed in climbing, was to be held negligence as a matter of law." (266 Pac. 281.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

# News About Men of the Industry

## *F. B. Lewis Elected to Vice-Presidency*

Fred B. Lewis, assistant general manager of the Southern California Edison Company, has been honored with the title of vice-president and in that capacity will assume greater responsibilities. In his new office he is to be vice-president and assistant general manager in charge of operation.

*F. B. Lewis*

Having joined the Edison company in 1905, following the completion of his engineering studies, Mr. Lewis has made steady progress from the position of meter reader to his present executive position.

During the 1924 power shortage Mr. Lewis, as chairman of the power committee, composed of representatives of all the power companies in the State of California, was very active in bringing about the interconnection of the physical systems of the electric utilities in California. One of his outstanding achievements during the four years in which he has been assistant general manager has been the inauguration of a system of budgets for operation of all departments.

During the nineteen years in which Mr. Lewis was associated with the Edison company, before being made assistant general manager, he had built up a background of steady and reliable performance. His first service with the Edison company was in the capacity of meter tester, which position he took after being graduated from Rose Polytechnic Institute at Terre Haute, Ind. He was advanced to the position of engineer of underground distribution, superintendent of the Los Angeles district, manager of operation and in 1924 to assistant general manager.

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JOSEPH INSULL, who has been assistant to the manager of the Pittsfield works of the General Electric Company since 1903, has just retired from active service at the age of 70. Mr. Insull has been connected with the General Electric organization for 41 years, starting in Schenectady. Later he became treasurer and manager of the General Incandescent Lamp Company in Cleveland and subsequently was named production manager of the General Incandescent Arc Light Company. Mr. Insull is a native of London, England. A gold watch was presented to him on his last day at the office by his associates.

JAMES P. MCKEARIN of the United Electric Light Company, Springfield, has been elected president of the Engineering Society of Western Massachusetts.

DR. VANNEVAR BUSH of the Massachusetts Institute of Technology was made the recipient of the Louis Edward Levy Medal by the Franklin Institute for two papers on electrical power transmission contributed to the Institute's journal.

DR. MICHAEL I. PUPIN, professor of electromechanics at Columbia University and past-president of the American Institute of Electrical Engineers, has been made the recipient of the Washington award for 1928. This annual prize was founded in 1917 by John W. Alvord, consulting engineer of Chicago, for presentation to engineers who have rendered pre-eminent service in promoting the public welfare.

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## *H. M. Sawyer Elected to New Executive Position*

H. M. Sawyer, general contract agent of the American Gas & Electric Company, has been elected vice-president. Mr. Sawyer was graduated from Cornell University in 1911, following which connection he joined the Scranton Electric Company as junior power engineer. In 1912 he went to Wheeling

*H. M. Sawyer*

as power engineer for the Wheeling Electric Company and in 1920 he removed to New York as assistant general contract agent, being made general contract agent in 1924.

## *J. A. Longley Assumes New Duties in Tennessee*

James A. Longley, for the past several years manager of the production and transmission department of the Tennessee Electric Power Company, has been appointed assistant to the general manager of that company and assistant to the president of the Nashville Railway & Light Company. Mr. Longley is a

*J. A. Longley*

native of Massachusetts and received his engineering education at Massachusetts Institute of Technology. His first connection with the electrical industry was in 1910 when he went to Portland, Ore., on power plant construction work for the Portland Railway, Light & Power Company. In 1913 he removed to Columbus, Ohio, just after the Dayton flood to work on location and construction of a power plant in that city, later transferring his interests to Nashville on the construction of the Nashville steam plant.

In October, 1914, he was transferred to Chattanooga as assistant general superintendent of the Tennessee Power Company and since that time he has been connected with the local utility interests with the exception of a year spent with the Arkansas River Oil & Gas Company in Kansas and Oklahoma. As manager of the production and transmission department of the Tennessee Electric Power Company Mr. Longley has been responsible for the operation of all power plants and the construction, operation and building up of the vast system of transmission lines throughout the territory of the company in middle and eastern Tennessee.

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VERNON W. PALEN, formerly assistant engineer in the engineering bureau of the New York & Queens Electric Light & Power Company, is now connected with the engineering department of the National Electric Light Association, New York. In his new position Mr. Palen will engage in work dealing with

problems related to and directly concerning overhead lines and construction. During his affiliation with the New York & Queens utility he directed his attention especially to the design of new primary feeders, secondary design work and the preparation of budget details. Mr. Palen was formerly affiliated with the Commonwealth Edison Company of Chicago.

A. V. BENNETT, who has been connected with the West Penn System since 1918, has been elected vice-president of the West Penn Power Company. Before joining the West Penn organization Mr. Bennett was affiliated with the American Water Works & Electric Company, Inc.

H. S. KERR, chief engineer of the Utah State Road Commission, has been elected president of the Engineering Council of Utah. Mr. Kerr takes a very active interest in the affairs of the engineering fraternity in Utah and has been chief engineer of the Utah State Road Commission since 1926. For the most part his activities have been centered in railroad and railway engineering.

RICHARD B. PARSONS has been appointed underground engineer of the Narragansett Electric Light Company, Providence, R. I., in charge of underground transmission and distribution.

SIGNOR GUIDO SEMENZA, general president of the Italian Association of Electrical Engineers, has recently been appointed an officer of the French Legion of Honor, as a mark of appreciation of his work as Italian commissioner at the Hydro-Electric Exhibition at Grenoble in 1925.

LOYALL A. OSBORNE, president of the Westinghouse Electric International Company, has been re-elected chairman of the National Industrial Conference Board at the recent annual meeting held at the Hotel Astor, New York. This will be the third year that Mr. Osborne has held the chairmanship of the board.

# Obituary

SIGNOR FRANCESCO P. JACCARINO, chief electrical engineer of the Società San Georgio of Sestri, Genoa, recently died. He was a leading Italian authority on transformer design and construction.

IRA H. SPENCER, president of the Spencer Turbine Company and previously head of the Spencer Turbine Cleaner Company and the Spencer Organ Blower Company previous to their consolidation with the first-named company, died April 28, at the Hartford Hospital, Hartford, Conn. He was an authority on compressed air machines and turbines and an inventor of some note. Mr. Spencer was born in Barkhamsted, Conn., 54 years ago.

JOHN MARTIN, a pioneer in California hydro-electric development, died in San Francisco, May 23, after a brief illness. He was born in Indianapolis in 1858 and removed to California in 1891. He was identified with a number of the early hydro-electric developments in northern California and was active in organizing gas and electric properties, culminating in the consolidation of many of these into what is now the Pacific Gas & Electric Company. At the time of his death he was chairman of the board of the Mid-Continent Utilities Corporation, serving a large territory between Illinois and Alabama.

WILLIAM H. YAWGER, for many years a vice-president and treasurer of the Weston Electrical Instrument Corporation, Newark, N. J., has resigned from active duty in order better to conserve his health. Mr. Yawger became associated with the Weston company in 1892, just four years after it was organized. His period of active service was 36 years and he still remains on the board of directors with the title of vice-president. Mr. Yawger was born in Lockport, N. Y., and was formerly associated with the Cowles Electric Smelting & Aluminum Instrument Company.

CHARLES G. WASHBURN, for many years chairman of the board of trustees of the Worcester Polytechnic Institute and one of the most distinguished citizens of Massachusetts, died suddenly at Lenox, Mass., May 25. He was educated at the Institute and at Harvard College, being a classmate and biographer of the late Theodore Roosevelt, and was a former member of Congress and a manufacturer of prominence at Worcester.

M. CRESCITZ, formerly vice-director of the Bureau Internationale de l'Union Telegraphique of Berne, Switzerland, died at Chelles, Seine-et-Marne, France, April 19, at the age of 72. It was only last November that he retired owing to ill health, after having been associated with the governmental department of post and telegraphs for more than 50 years.

ARTHUR D. DANA, organizer and formerly president of the Chicago Fuse Manufacturing Company, died May 25 at his home in New York after a long illness. A native of Marietta, Ohio, and a graduate of Marietta College, Mr. Dana removed to Chicago, where he joined the Linkbelt Machinery Company, of which he was treasurer until 1896. The Chicago Fuse Manufacturing Company, which he formed, became one of the largest manufacturers of electric protecting materials and allied products and Mr. Dana continued as president and chairman of the board until 1924, when he retired because of ill health. He was an intimate friend of Elmer A. Sperry, the inventor, and was associated with him in the formation of the Sperry Electrical Company about 35 years ago, later becoming a director of the Sperry Gyroscope Company. Mr. Dana was actively identified with other industrial enterprises, having been formerly owner of the Moore Drop Forging Company, Springfield, Mass., and a member of the executive committee of the Goodman Manufacturing Company of Chicago before he relinquished his business activities.

ARTHUR W. GUCKER, for several years manager of the Iowa Public Service Company plant in Carroll, Iowa, died suddenly May 6 in his home in that city at the age of 47.

L. J. KIMMEL, engineer-inventor, died in Spokane, Wash., April 17 in his forty-eighth year. Mr. Kimmel was the inventor of the Electro-Kold refrigerator and a co-inventor of the No-Kold automatic oil burning furnace. At the time of his death he was vice-president and factory superintendent of the Electro-Kold Corporation in Spokane.

RALEIGH C. THOMAS, 51 years old, an electrical engineer, was found dead in his sister's apartment in Washington, D. C., May 1. Until recently he was employed by the United States Shipping Board. Formerly Mr. Thomas was prominently identified with the Baltimore city government. He was graduated from Princeton University, where he took an engineering course. After serving as assistant engineer in the Electrical Subway Department of Baltimore he was elected, in 1903, city surveyor. He became chief engineer of the Electrical Commission in 1910, which position he held until 1917, when he received a commission in the Engineer Corps.

JOHN C. HATZEL, president of Hatzel & Buehler, Inc., electrical engineers and contractors, died May 25 at his home in New York in his 69th year. Mr. Hatzel was a native of New York City and was educated at the College of the City of New York. He became an associate of Thomas A. Edison in the early days of electrical development in this country and after serving for four years in the construction department of the Edison Electric Company, in the fall of 1885 he engaged in electrical engineering and contracting, installing central stations and isolated plants and constructing electric railways in various parts of the country. Subsequently he became president of the Western Edison Company, representing the Edison interests in Colorado, Utah and New Mexico. Returning East, he formed a partnership with Joseph Buehler in the fall of 1889, this partnership continuing until 1911, when Mr. Buehler retired. The business was continued by Mr. Hatzel under the old firm name. In the course of his career he was active in the American Institute of Electrical Engineers, the Illuminating Engineering Society, the Electrochemical Society, the New York Electrical Society and the Engineers' Club.

# Financial and Statistical News

## New Capital Issues

During the week ended May 31 the Indiana Hydro-Electric Power Company made an offering of first mortgage 5 per cent gold bonds, series A, to the amount of $3,000,000, the price being 99½ and interest, to yield over 5 per cent. These bonds, dated May 1, 1928, mature May 1, 1958. Proceeds from the sale of these bonds will be applied toward the retirement of all outstanding bonds of the company carrying higher interest coupons.

Thirty-year 6 per cent sinking fund gold debentures, series A, of the Southern Cities Utilities Company were offered at 99½ and accrued interest, to yield over 6 per cent, a piece of financing involving a total of $3,000,000. These debentures, dated Feb. 1, 1928, will mature Feb. 1, 1958. Proceeds from the sale of these debentures and of other securities now being issued will be or have been used to retire outstanding funded debt of the company, to acquire or redeem funded debt and preferred stocks of certain subsidiary companies, to acquire through a subsidiary certain electric properties located in the Dominican Republic and for other corporate purposes.

## March Operations Trend Upward

MARCH operating revenues of electric light and power companies amounting to $157,300,000, expenses aggregating $65,100,000 and an energy production of 6,742,681,000 kw.-hr. are indicated for the country as a whole by monthly reports received and compiled by the ELECTRICAL WORLD. The revenue in December exceeded that of the corresponding month of the preceding year by 6.5 per cent. This was followed by 6.7 per cent in January, 7.9 in February and 7.6 in March. The upward trend seems clear. Slightly irregular figures in February are to be expected in view of the extra day.

Compared with the winter months there was, of course, the usual seasonal decrease both in energy output and in revenue, but in both respects operations were fairly close to the estimated normal based on past growth and observed seasonal variations. The average daily revenue for March was $5,080,000; the normal would have been $5,230,000. Not only has the usual increase occurred, therefore, but it has carried the revenue within 3 per cent of what might have been expected had the rapid expansion of the past five years continued unchecked. The average daily energy production, 217,000,000 kw.-hr., misses the estimated normal by about 1 per cent.

Approximately 40 per cent of the energy came from water power. This is more than the yearly average and reflects the effect of spring stream flow; compared with last year the increase was small—only 6.1 per cent—while the

*Table I—Generation and Distribution of Central-Station Energy in the United States*
(100 Per Cent of the Industry)

| Month | Kw.-Hr. Generated Monthly * | | | Estimated Distribution of Energy Generated: Total Energy Consumption by Central-Station Customers, Kw.-Hr. | | Energy Consumed for Lighting, Kw.-Hr. | | Energy Consumed for Power, Kw.-Hr. | | Energy Sold to Electric Railways, Kw.-Hr. | | Energy Used in Intracompany Business, Including Line Losses, Kw.-Hr. | | Energy Purchased by Public Utilities for Resale, Kw.-Hr. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1927 Thousands | 1926 Thousands | Per Cent Inc. | 1927 Thousands | 1926 Thousands | 1927 Thousands | 1926 Thousands | 1927 Thousands | 1926 Thousands | 1927 Thousands | 1926 Thousands | 1927 Thousands | 1926 Thousands | 1927 Thousands | 1926 Thousands |
| Dec... | 6,811,347 | 6,375,500 | +6.8 | 5,605,347 | 5,247,500 | 1,500,000 | 1,400,000 | 3,475,347 | 3,226,500 | 630,000 | 621,000 | 1,206,000 | 1,128,000 | 1,220,000 | 1,120,000 |
| | 1928 | 1927 | | 1928 | 1927 | 1928 | 1928 | 1928 | 1927 | 1928 | 1927 | 1928 | 1927 | 1928 | 1927 |
| Jan... | 6,767,866 | †6,303,199 | ††7.4 | 5,582,866 | 5,188,199 | 1,493,000 | 1,395,000 | 3,514,866 | 3,170,199 | 575,000 | 623,000 | 1,185,000 | 1,115,000 | 1,244,000 | 1,090,000 |
| Feb.... | 6,411,996 | †5,706,468 | ††12.4 | 5,281,996 | 4,696,468 | 1,395,000 | 1,210,000 | 3,376,996 | 2,928,468 | 510,000 | 558,000 | 1,130,000 | 1,010,000 | 1,211,000 | 1,017,000 |
| March | 6,742,681 | †6,314,272 | ††6.8 | 5,547,681 | 5,194,272 | 1,400,000 | 1,305,000 | 3,617,681 | 3,304,272 | 530,000 | 585,000 | 1,195,000 | 1,120,000 | 1,283,000 | 1,101,000 |

*Data on "energy generated" are those collected and published by the United States Geological Survey for all public utilities minus such data as are collected on energy generated by electric railway companies, reclamation service and manufacturing plants. The data are, therefore, for the electric light and power industry only.
†1928 figures are only approximately comparable with those for 1927, because of changes in classification of certain plants.

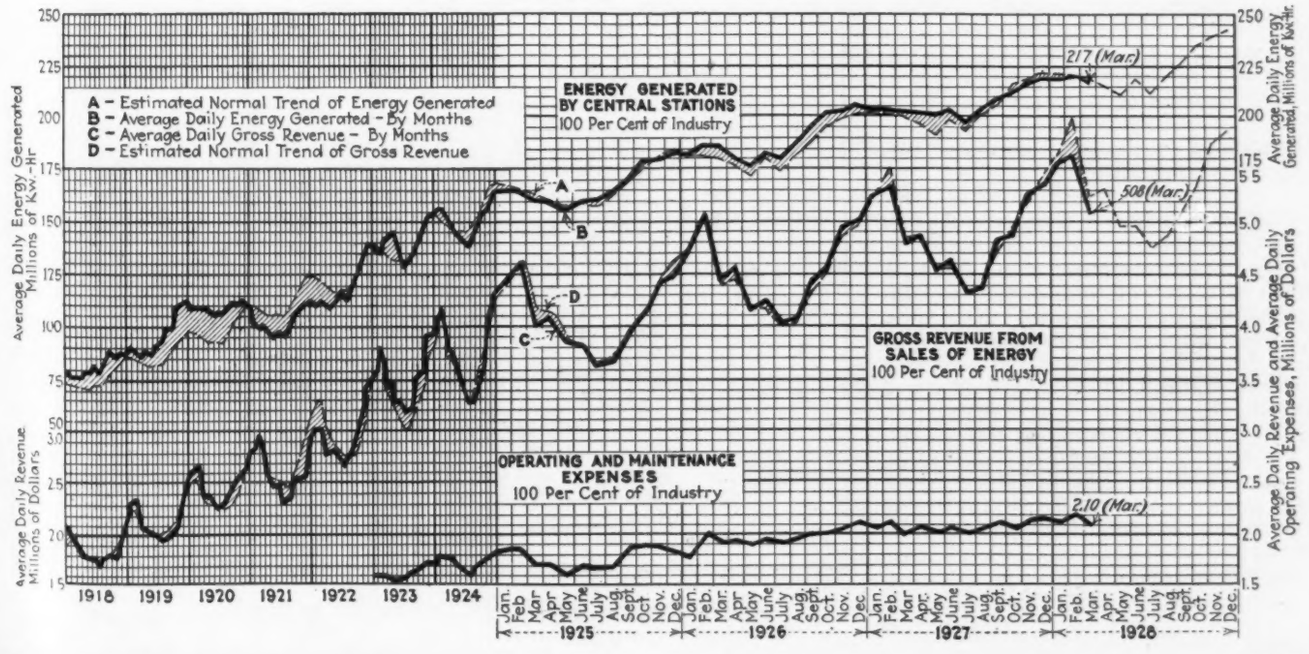

A – Estimated Normal Trend of Energy Generated
B – Average Daily Energy Generated – By Months
C – Average Daily Gross Revenue – By Months
D – Estimated Normal Trend of Gross Revenue
ENERGY GENERATED BY CENTRAL STATIONS
100 Per Cent of Industry
GROSS REVENUE FROM SALES OF ENERGY
100 Per Cent of Industry
OPERATING AND MAINTENANCE EXPENSES
100 Per Cent of Industry
217 (Mar.)
508 (Mar.)
2.10 (Mar.)
Average Daily Energy Generated, Millions of Kw.-Hr.
Average Daily Energy Generated, Millions of Kw-Hr
Average Daily Revenue and Average Daily Operating Expenses, Millions of Dollars
Average Daily Revenue, Millions of Dollars
1918 1919 1920 1921 1922 1923 1924
1925 1926 1927 1928

*Table II—Central-Station Financial Operations for Four Months in the United States*

(100 Per Cent of the Industry)

| Month | Total Gross Revenue from Sale of Energy† | | | Estimated Distribution of Gross Revenue | | | | | | | | Total Operating and Maintenance Expenses‡ | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Lighting Customers | | Power Customers | | Electric Railways | | Other Public Utilities | | | |
| | 1927 Thousands | 1926 Thousands | Per Cent Inc. | 1927 Thousands | 1926 Thousands | 1927 Thousands | 1926 Thousands | 1927 Thousands | 1926 Thousands | 1927 Thousands | 1926 Thousands | 1927 Thousands | 1926 Thousands |
| Dec..... | $165,100 | $155,000 | +6.5 | $95,900 | $90,800 | $52,200 | $48,100 | $5,200 | $5,000 | $11,800 | $11,100 | $67,900 | $63,200 |
| | 1928 | 1927 | | 1928 | 1927 | 1928 | 1927 | 1928 | 1927 | 1928 | 1927 | 1928 | 1927 |
| Jan..... | 171,800 | 161,100 | +6.7 | 101,500 | 95,400 | 53,400 | 49,300 | 5,600 | 5,600 | 11,300 | 10,800 | 65,650 | 63,400 |
| Feb..... | 163,100 | 151,100 | +7.9 | 96,000 | 89,800 | 50,500 | 45,700 | 5,500 | 5,400 | 11,100 | 10,200 | 63,500 | 60,200 |
| March.... | 157,300 | 146,200 | +7.6 | 92,200 | 88,100 | 49,200 | 41,900 | 5,100 | 5,300 | 10,800 | 10,900 | 65,100 | 62,400 |

†Aggregate gross revenue from actual consumers, and sales to other public utilities for resale, involving a certain amount of duplication.
‡Do not include interest, taxes, depreciation or sinking fund.

*Table III—Operations of Central-Station Hydro and Fuel Plants in the United States**

(100 Per Cent of the Industry)

| Month | Energy Generated | | | | | | Fuel Consumption | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Hydro-Plants | | | Fuel Power Plants | | | Coal | | | Oil | | | Gas | | |
| | 1927 Thousands of Kw.-Hr. | 1926 Thousands of Kw.-Hr. | Per Cent Increase | 1927 Thousands of Kw.-Hr. | 1926 Thousands of Kw.-Hr. | Per Cent Increase | 1927 Short Tons | 1926 Short Tons | Per Cent Increase | 1927 Barrels | 1926 Barrels | Per Cent Increase | 1927 Thousands of Cubic Feet | 1926 Thousands of Cubic Feet | Per Cent Increase |
| Dec..... | 2,697,770 | 2,377,175 | +13.5 | 4,113,577 | 3,998,325 | + 2.9 | 3,340,137 | 3,406,140 | —1.9 | 624,276 | 769,518 | —18.9 | 4,805,064 | 3,685,611 | +30.4 |
| | 1928 | 1927 | | 1928 | 1927 | | 1928 | 1927 | | 1928 | 1927 | | 1928 | 1927 | |
| Jan..... | 2,609,283 | 2,331,140 | +11.9 | 4,158,583 | 3,972,059 | + 4.7 | 3,321,568 | 3,365,461 | —1.3 | 560,871 | 786,062 | —28.6 | 4,955,262 | 3,900,868 | +27.0 |
| Feb..... | 2,463,046 | 2,172,740 | +13.4 | 3,948,950 | 3,533,728 | +11.8 | 3,126,830 | 2,958,797 | +5.7 | 516,557 | 646,558 | —20.3 | 4,896,497 | 3,859,791 | +26.8 |
| March.... | 2,708,730 | 2,551,792 | + 6.1 | 4,033,951 | 3,762,480 | + 7.2 | 3,119,266 | 3,090,984 | +0.9 | 575,684 | 612,657 | — 5.9 | 5,602,443 | 4,312,322 | +30.0 |

*As collected by United States Geological Survey. The data are for the electric light and power industry only.

output from fuel rose by 7.2 per cent and amounted to 4,033,951,000 kw.-hr., requiring the consumption of 3,119,266 tons of coal, 575,684 bbl. of fuel oil and 5,602,443,000 cu.ft. of natural gas; the first increased about 1 per cent, the last 30 per cent and the oil decreased nearly 6 per cent, compared with March, 1927.

Regionally, the most notable departures from the national average occurred in the East and West South Central States, where the year's increase in energy output was 13 and 17 per cent, respectively. The revenue figures likewise reveal the central South as the section having the most rapid gains; the per cent increase, by regions, compared with March, 1927, being as follows:

| | |
|---|---|
| New England | 5.7 |
| Atlantic | 8.0 |
| North Central | 6.3 |
| South Central | 14.4 |
| Western | 9.3 |

Purchase of energy for resale again approached 1,300,000,000 kw.-hr., and was 16 per cent greater than a year ago. Returns on this item are particularly affected by consolidations; data for successive years are therefore only broadly comparable.

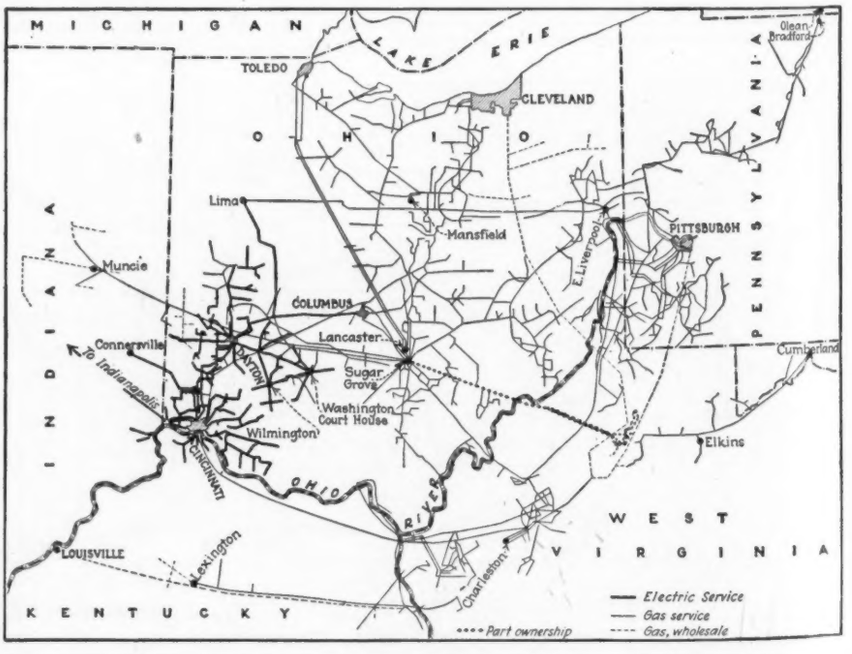
**Standard Gas & Electric Shareholders Approve Changes in Set-up.**—At the annual meeting of the Standard Gas & Electric Company held at Wilmington, Del., May 16, the shareholders approved the proposed changes in the prior preference and preferred stocks outlined in the April 21 issue of the Electrical World. The plan called for the changing of the 500,000 shares of 7 per cent prior preference stock of $100 par value to 750,000 shares of no-par prior preference stock and changing the authorized amount of 8 per cent cumulative preferred stock from 600,000 shares of $50 par value to 1,500,000 shares without par value.

# Columbia Gas & Electric Corporation Consolidates Its Properties

Gross earnings of more than $96,000,00 class Columbia Gas & Electric Corporation among the nation's important utility groups. Serving a number of rapidly growing areas, chiefly in Ohio, Pennsylvania and West Virginia, this group has gradually built up a number of valuable operating units and has assets of $520,000,000.

Analysis of the corporation's financial position for the past year shows a growth of 5 per cent in gross earnings, while gross earnings from electrical operations alone increased by 12½ per cent. Total operating expenses, including taxes, increased 9.1 per cent, bringing the operating ratio up to 67 per cent, against 65 in 1926. Furthermore, other income dropped off sharply from $3,073,212 to $881,041, due to the cutting off of income from a block of bonds which the corporation sold for construction rather than issuing additional parent company securities.

The no par common stock of the parent company, of which there are




*Electric and gas systems of Columbia Gas & Electric Corporation*

3,372,226 shares outstanding, has had a rapid rise recently from a low this year of $89 to a recent high of $118. This stock pays $5 per share and earned $5.28 last year. Interest charges for the system as a whole were earned more than five times during 1927. The property investment of the system is about $4.72 per dollar of gross revenue, which is somewhat below the average for comparable systems.

During the year Columbia Gas & Electric has continued its policy of consolidating subsidiary operating properties, and, as a result, the financial structure is being greatly strengthened. There have been withdrawn from the hands of the public nine complete issues of bonds and stocks of subsidiary companies. In addition, four bond issues of subsidiaries and one bond issue of a leased company were called for redemption. The process retires some $40,567,672 of securities.

The officers of the Columbia Gas & Electric Corporation pursue an aggressive policy of acquiring neighboring properties whose location and operation make them logical constituents of the system. Several of these were acquired during the past year and have been or will be thoroughly co-ordinated with the system.

## Metropolitan Edison Changes Capital Structure

To provide for improvements and future expansion the Metropolitan Edison Company has increased its authorized capital stock from 900,000 shares, consisting of 400,000 shares of preferred stock and 500,000 shares of common stock, both without par value, to 1,500,000 shares, consisting of 1,000,000 shares of preferred stock and 500,000 shares of common stock, both without par value. The authorized indebtedness of the company has been increased from $50,000,000 to $100,000,000.

In authorizing these changes, stockholders at a special meeting voted favorably for the creation of a new class of preferred stock, to be known and designated as $5 cumulative preferred stock, and to revise the preferred stock of the company into 50,000 shares of $7 cumulative preferred stock, 400,000 shares of $6 cumulative preferred stock, 550,000 shares of $5 cumulative preferred stock.

## Average Output 3,020 Kw.-Hr. per Kilowatt in 1927

Analysis of the recent report of the U. S. Geological Survey on the output of public utility plants during 1927 reveals a wide range in output per average kilowatt of generator capacity.

A summary of the report was published in the ELECTRICAL WORLD of April 28, 1928, on page 890. The present tabulation is based on the kilowatt-hour figures there given and on the mean of the installation at the beginning and at the end of the year. The influ-

KILOWATT-HOURS PER KILOWATT IN 1927

| Region | Kw.-Hr. per Kw. |
|---|---|
| United States | 3,020 |
| New England | 2,275 |
| Middle Atlantic | 3,115 |
| East North Central | 3,080 |
| West North Central | 2,495 |
| South Atlantic | 2,810 |
| East South Central | 2,670 |
| West South Central | 3,365 |
| Mountain | 3,810 |
| Pacific | 3,650 |

# *Stock Quotations of Electric Light and Power and Manufacturing Companies*

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

| Companies | Bid Price Monday May 28 | Low 1928 | High 1928 |
|---|---|---|---|
| **ABITIBI PWR. & PAPER, com., new — no par** | 74 | 70 | 85 |
| Ala. Pwr., $7 cum. pf.—no par | m115½ | 114½ | 115½ |
| Allis Chalmers Mfg.,6% com. | 122½ | 115½ | 129½ |
| Aluminum Co. of Amer., com. | 181 | 120 | 197½ |
| Aluminum Co. of Amer., 6% pf. | 109½ | 105½ | 110½ |
| Amer & Foreign Pwr., 7% pf.—no par | 109 | 105½ | 110 |
| Amer. & Foreign Pwr., com.—no par | 35½ | 22½ | 38½ |
| Amer. Bosch Magneto, com.—no par | 40½ | 15½ | 40½ |
| Amer. Brown Boveri Elec.† | 20½ | 10½ | 26½ |
| Amer. Brown Boveri Elec., pf. $7 | 62½ | 40½ | 65½ |
| Amer. Gas & Elec., 6% pf.—no par | m107 | 105 | 108½ |
| Amer. Gas & Elec., com. †—no par | 170½ | 117½ | 184 |
| Amer. Lt. & Trac., 6% pf. | 115 | 114½ | 118 |
| Amer. Lt. & Trac., new com. | 240 | 170 | 249 |
| Amer. Pwr. & Lt., 6% pf. | 107½ | 106½ | 107½ |
| Amer. Pwr. & Lt., com. †—no par ex.div. | 86 | 62½ | 95 |
| Amer. Pub. Serv., 7% pf. | a102½ | 97½ | 102½ |
| Amer. Pub. Serv., com. † | m 65 | 70 | 75 |
| Amer. Pub. Utilities, 7% ptc. pf. | a 97 | 87½ | 97 |
| Amer. Pub. Utilities, 7% pr. pf. | a102½ | 95½ | 102½ |
| Amer. Pub. Utilities, com. | m 50 | ... | ... |
| Amer. States Sec., A | a 11½ | 4 | 13½ |
| Amer. States Sec., B | 15½ | 7½ | 18½ |
| Amer. Superpwr., 6% 1st pf. | l103½ | ... | ... |
| Amer.Super pwr., Class A†—no par | 45½ | 36½ | 56 |
| Amer.Super pwr., Class B†—no par | 46½ | 37 | 56½ |
| Amer. Wtr. Wks. & Elec., 6% pf. | 103½ | 101½ | 106 |
| Amer. W.W. & E., com. new—no par ex.div. | 62 | 52½ | 70½ |
| Anaconda Copper cap. $3 | 73½ | 53½ | 74½ |
| Appalachian Electric Pwr., 7% pf. | 109 | 108½ | 110 |
| Arkansas Pwr. & Lt. 7% pf | 108 | 107½ | 111 |
| Assoc. Gas & Elec., $3.50—50 | 54½ | ... | ... |
| Assoc. Gas & Elec., pf.—$6—no par. | 97 | 96 | 98½ |
| Assoc. G. & E., Class A, 10—no par. | 48½ | 47 | 52½ |
| **BABCOCK & WILCOX, 7% com.** | 124 | 117½ | 128 |
| Binghamton L., H. & P., $6 pf. | 107 | 102 | 109½ |
| Birmingham Elec., pf.—$6—no par. | 107 | 104 | 107 |
| Blackstone Valley G. & E., 6% pf. | m109 | 106 | 112 |
| Blackstone Valley Gas & Elec., 10% com.—50 | m165 | 135 | 170 |
| Blaw-Knox, com.† | k 98 | 91 | 105 |
| Brazilian Trac., Lt. & Pwr.,com.,new | f 60½ | ... | ... |
| Broad River Pwr., 7% pf. | 106 | 105 | 108½ |
| Brooklyn Edison, 8% com. | 252½ | 206½ | 268½ |
| Buffalo, Niagara & East. Pwr., $1.60 pf.—25 | 26½ | .... | .. . |
| Buffalo, Niagara & East. Pwr. com. $1.20—no par | k 44 | ..... | .... |
| **CALIFORNIA ELEC. GENERATING, 6% pf.** | 99 | 98 | 101 |
| Carolina Pwr. & Lt., pf.—$7—no par | l111½ | 109 | 111 |
| Central & S. W. Util., $7 pf.—no par | a103½ | 99½ | 105½ |
| Central & S. W. Util., pr. in. $7 pf.—no par | a109½ | 103½ | 112 |
| Central Ark. Ry. & Lt., 7% pf. | 106 | 105 | 107½ |
| Central Ill. Pub. Serv., $6 pf. | a 99½ | 97½ | 100½ |
| Central Ind. Pwr., 7% pf. | a100 | 95 | 101 |
| Central Maine Power, 6% pf. | 97 | 96 | 98½ |
| Central Maine Power, 7% | 110 | 109 | 112 |
| Central Pwr. & Lt., 7% pf. | 110½ | 104½ | 111½ |
| Central States Elec., 7% pf. | 117 | 104½ | 121½ |
| Cincinnati Gas & Elec., 5% com. | g100½ | 97½ | 100½ |
| Cities Service, $6 pf.—no par | l 102½ | 94½ | 103½ |
| Cities Service, pf. B—no par | l 9½ | 8½ | 9½ |
| Cities Service, pf. BB—no par | k 97 | 88½ | 97 |
| Cities Service, com.—20 | k 69½ | 54 | 70 |
| Cities Service, Bks. Shrs.—10 | k 34½ | 26½ | 34½ |
| Cities Service Pwr. & Lt., 7% pf. | m108 | 106 | 109½ |
| Cities Service Pwr. & Lt., 6% pf. | 101½ | 95½ | 102 |
| Cleveland Elec. Illg., 6% pf. | 113 | 113 | 115½ |
| Cleveland Elec. Illg., 10% com. | 425 | 350 | 425 |
| Columbia Gas & Elec., 6% pf. | 109½ | 107½ | 110½ |
| Columbia G. & E. com. $5—no par | 113½ | 89½ | 118½ |
| Columbus Elec. & Pwr., $2 com.—no par | m 79 | 66 | 79½ |
| Columbus Elec. & Pwr., 7% | 109 | ... | ... |
| Columbus Ry., Pwr. & Lt., 7% | 109 | 107 | 111 |
| Columbus Ry., Pwr. & Lt., 7% pf. B | 109 | 105 | 111 |
| Columbus Ry., P. & L t. com. no par | 125 | 120 | 125 |
| Commonwealth Edison, 8% com. | a182½ | 165 | 189 |
| Commonwealth Pwr., 6% pf. | 103½ | 102½ | 104½ |
| Commonw'th Pwr., $2, com.—no par | 84 | 62½ | 87½ |
| Conn. Lt. & Pwr., 8% pf. | 121 | 120 | 123 |
| Conn. Lt. & Pwr., 7% pf. | 117½ | 118 | 121 |
| Cons. Gas of N. Y., pf. | 102½ | 101½ | 105 |
| Cons. Gas of N. Y., com. $5—no par. ex.div. | 158 | 119½ | 170½ |
| Cons. Gas, Elec. Lt. & Pwr. of Balti., 6% pf. | e111 | 110 | 114½ |
| Cons. Gas, Elec. Lt. & Pwr. of Balti., 5% pf. | e104½ | 100½ | 105½ |
| Cons. Gas, Elec. Lt. & Pwr. of Balti., com. $3.00—no par | e 89½ | 67½ | 93 |
| Consolidated Pwr. & Lt., 7% pf. | m105 | ... | ... |
| Consumers Pwr., 6% pf. | 104½ | 106 | 107 |
| Consumers Pwr., 6.6% pf. | 105 | 106 | 107 |
| Continental Gas & Elec., 7% pr. pf. | 108 | 106½ | 108½ |
| Conti. G. & E. com. $4.40—no par. | m250 | 240 | 265 |
| Crocker Wheeler, com.† | 62 | 23 | 70 |
| Crocker Wheeler, 7% pf. | 95 | ... | ... |
| **DALLAS PWR. & LT., 7% pf.** | 110 | 110 | 111½ |
| Dayton Pwr. & Lt., 6% pf. | 109½ | 108½ | 110½ |
| Derby Gas & Elec., 7% pf. | 102 | 96 | 100½ |
| Detroit Edison, 8% com. | 199½ | 166½ | 199½ |
| Dubilier Condenser, com.—no par. | 4½ | 2½ | 5½ |
| Duke Pwr., cap. | m140 | 130 | 145 |
| Duquesne Lt., 5% pf. | m104½ | 104½ | 116½ |
| **EASTERN NEW YORK UTIL., $7 pf.** | m110 | 111 | 112½ |
| Eastern States Pwr. B | 23 | 11½ | 26½ |
| Eastern States Pwr., pf. | m100½ | 98 | 100½ |
| East. Tex. Elec., 7% pf. | 108 | 106 | 109 |
| Edison Elec.of Boston, $12 com. | e295 | 252 | 305 |
| El Paso Elec. 7% pf. | 110 | 110 | 112½ |
| Elec. Bond & Share, 6% pf. | l109½ | 108½ | 111½ |
| Elec. Bd. & Sh. Sec., com. $1—no par ex. rights | l105 | 76 | 127½ |
| Electric Household Util.† | a 26½ | 13½ | 26½ |
| Elec. Investors, 6% pf.—no par. | 104½ | 101 | 104½ |
| Elec. Investors, com.†—no par. | 70 | 40½ | 79½ |
| Elec. Pwr. & Lt., ctfs. pf. | 109½ | 106½ | 110½ |
| Elec. Pwr. & Lt., ctfs., 40% pd. | m127 | 120½ | 129½ |
| Elec. Pwr. & Lt., ctfs., com.—no par | 42½ | 28½ | 45½ |
| Elec. Ry. Securities, com.—no par. | 6½ | ... | ... |
| Elec. St. Battery com. $5.25—no par | 82½ | 69 | 84½ |
| Elmira Wtr., Lt. & R.R., 7% pf. | 105 | 104 | 107 |
| Empire Pwr., pte.† | 37½ | 27½ | 39½ |
| Engr. Pub. Serv. $5, pf.—no par | m 99½ | 99½ | 102 |
| Engr. Pub. Serv., com.—no par | 42½ | 33 | 46½ |
| Eureka Vacuum Cleaner, com. $4—no par | 73½ | 69 | 79 |
| **FAIRBANKS MORSE, 7% pf.** | m109 | 104 | 114½ |
| F.-M., com.—$3—no par | 44½ | 32½ | 54 |
| Federal Lt. & Trac.,com $1.40 | 55 | 42 | 56½ |
| Federal Lt. & Trac., $6 pf.—no par ex.div. | 107 | 98 | 109 |
| Florida Pwr. & Lt., 7% pf. | 107½ | 104½ | 108½ |
| Ft. Worth Pwr. & Lt., 7% pf. | l114 | 113 | 114½ |
| **GALVESTON-HOUSTON ELEC. 6% pf.** | 80 | 75 | 85 |
| Galveston-Houston Elec., com. | 33 | 31½ | 42½ |
| General Cable, Cl.A | 74½ | 56 | 84½ |
| Gen. Elec. $3 com.—no par. | 160½ | 124 | 174½ |
| Gen. Elec., special—6% | 11½ | 11½ | 11½ |
| Gen. Gas & Elec. (Del.) com A $1.50—no par | 46 | 35½ | 50½ |
| Gen. G. & E. (Del.) pf. A.$8—no par | 135 | 125 | 144 |
| Gen. G. & E. (Del.) pf. A $7—no par | m116½ | 108½ | 118 |
| Gen. G. & E. (Del.) pf. B $7 | 114 | 105½ | 114½ |
| Gen. Pub. Serv., $7 pf. | 98 | ... | ... |
| Gen. Pub. Serv., com., no par. | 26½ | 16½ | 29 |
| General Public Utilities, $7 pf. | m102 | 98 | 101 |
| Ga. Lt., Pwr. & Rys., com. | m 58 | 55 | 65 |
| Gt. Western Pwr., 7% pf. | h105 | .... | .... |
| **IDAHO PWR., 7% pf.** | 110 | 109 | 111½ |
| Ill. No. Utilities, 6% pf. | m 99 | 96 | 100 |
| Ill. Pwr. & Lt., 7% pf. | 105½ | 103 | 107 |
| Indianapolis Pwr. & Lt., 6½% pf. | 108 | 102 | 107½ |
| Indianapolis Pwr. & Lt., 7 pf. | 102 | 100 | 105 |
| Ingersoll Rand com. | m 95 | 90 | 98 |
| Int. Combus. Engr., com. $2—no par | 59½ | 45½ | 65½ |
| Int. Combustion Engr.,7% pf. | fm108 | 103 | 109 |
| Int. Util., Class A—$3.50—no par. | 49½ | 44½ | 52 |
| Int. Utilities, Class B—no par. | 19½ | 6½ | 19½ |
| Interstate Pwr., pf.—$7—no par. | 104½ | 99 | 103½ |
| Interstate Pub. Serv., 7% pf. | 106 | 103 | 106½ |
| Iowa Ry. & Lt., 7% pf. | 101 | 102 | 103 |
| **JERSEY CENTRAL PWR. & LT. CO., 7% pf.** | 108 | 106 | 108 |
| Johns-Manville. com.†—no par. | 124 | 111½ | 134 |

Stock Exchange: *a*Chicago; *b*St. Louis; *c*Philadelphia; *d*Boston; *e*Baltimore; *f*Montreal; *g*Cincinnati; *h*San Francisco; *i*Pittsburgh; *j*Washington; *k*Cleveland. *l*Bid price Tuesday, May 29. *m*Bid price Saturday, May 26. *n*Latest quotations available. †Dividend rate variable.

## *Stock Quotations of Electric Light and Power and Manufacturing Companies (Continued)*

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

| Companies | Bid Price Monday May 28 | Low 1928 | High 1928 |
|---|---|---|---|
| **KANSAS CITY POWER & LIGHT** | | | |
| pf. $7 | 112 | 109 | 114 |
| Kansas Gas & Elec. 7% pf. | *l*110 | 107 | 110 |
| Kelvinator Corp. | 20¼ | 11¼ | 22¾ |
| Kentucky Hydro-Elec., 7% pf. | *m*104 | 102 | 104¼ |
| Kentucky Sec., 6% pf. | 95 | 94 | 98 |
| Kentucky Sec., 5% com. | 150 | 140 | 150 |
| Kentucky Utilities, 6% pf. | 105 | 100 | 105 |
| **LACLEDE GAS LT., 10% com.** | *m*210 | 200 | 260 |
| Lehigh Pwr. Sec., com.—no par | 38¼ | 19¼ | 40 |
| Long Island Ltg., 7% pf. | 110¼ | 109¼ | 112¼ |
| Long Island Ltg., 6% pf. | *m*108 | 107 | 109 |
| Long Island Ltg., com.†—no par | *m*250 | 170 | 250 |
| Los Angeles Gas & Elec., 6% pf. | *h*111¼ | 105¼ | 112¼ |
| Louisville Gas & Elec., cl. A. $1.75 | 37¼ | 28 | 41 |
| **MAN. ELEC. SUPPLY, cap. $5—no par** | 57¼ | 50 | 61 |
| Maytag Co., com. 50—no par | 37¼ | 30 | 40½ |
| Memphis P. & L., pf.—$7—no par | 110 | 109 | 111 |
| Metropolitan Ed., pf.—$6—no par | 107 | 103 | 109¼ |
| Metropolitan Ed., pf.—$7—no par | 109¼ | 109 | 111¼ |
| Metropolitan Ed., com. $8—no par | *m*170 | 125 | 185 |
| Middle West Utilities, 6% pf. | *a*100 | 93¼ | 100¼ |
| Middle West Util., 6% pr. lien | *a*107 | 99 | 108 |
| Middle West Util., com. $7—no par | *a*153¼ | 123¼ | 169 |
| Midland Utilities, pr. ln. 6% pf. | *a* 96½ | 94¼ | 97 |
| Midland Utilities, 6% pf. A | *a* 90¼ | 89¼ | 92¼ |
| Milwaukee Elec. Ry. & Lt., 7% pf. | 105 | 100 | 106 |
| Milwaukee Elec. Ry. & Lt., 6% pf. | 100 | 98 | 110 |
| Minn. Pwr. & Lt., 7% pf. | *l*108¼ | 107 | 109 |
| Miss. River Pwr., 6% pf. | 111 | 94 | 112¼ |
| Mohawk Hudson Pwr., 1st pf.—$7—no par | *m*107 | 100 | 110 |
| Mohawk Hudson Pwr., 2d pf.—$7—no par | *m*105 | 100 | 109 |
| Mohawk Hudson Pwr. com.—no par | 44 | 29¼ | 53 |
| Montana Pwr., 5% com. | *m*168 | 102¼ | 175 |
| Montreal Pwr., 7% com. | *f* 107 | .... | .... |
| Mountain States Pwr., 7% pf. | *m*104 | 97 | 105 |
| Mountain States Pwr., com.† | 18 | .... | .... |
| **NASSAU & SUFFOLK LTG., 7% pf.** | 110¼ | 98 | 110¼ |
| National Carbon, 8% pf. | *a*138½ | 136¼ | 139¼ |
| National Elec. Pwr., A† | *a* 37¼ | 27¼ | 42 |
| National Pwr. & Lt., pf.—7% | 108 | 108¼ | 111 |
| National Pwr. & Lt., com.†—no par. ex div. | 34¼ | 21¼ | 36¼ |
| National Pub. Serv., 7% pf. | 103 | 99 | 103 |
| National Pub. Serv., 7% pfc., pf. | 114 | .... | .... |
| National Pub. Serv., A com. $1.60—no par | 28¼ | 22 | 29¼ |
| National Pub. Serv., B com.—no par | 32¼ | 24¼ | 34¼ |
| Nebraska Pwr., 7% pf. | *l*109¼ | 110 | 111¼ |
| Nevada-Calif. Elec., com. | *m*42¼ | 33¼ | 42¼ |
| New Brunswick Pwr., 4% pf. | 64 | 60 | 70 |
| New Eng. Pub. Serv., pr. in. pf. $7 | 110 | 98¼ | 110¼ |
| New Eng. Pub. Serv., pf. $7 | 106 | 95 | 108 |
| New Orleans Pub. Serv.—7% pf. | 107½ | 106 | 110 |
| N. Y. & Queens Elec. Lt. & Pwr., 5% pf. | 102 | 91 | 100 |
| N. Y. Central Elec., 7% pf. | 105 | 101 | 105¼ |
| New York Power & Light 7% pf. | 114 | .... | .... |
| NiagaraFalls Pwr., 7% pf.—25 | 28¼ | 27¼ | 29 |
| No. Amer., 6% pf.—50 | 55½ | 53¼ | 55¼ |
| No. Amer., com.—10 | 74¼ | 58¼ | 78¼ |
| No. Amer. Edison, $6 pf.—no par. ex. div. | 103¼ | 102¼ | 105¼ |
| Northeastern Pwr., com. | 29½ | 19¼ | 31 |
| No. N. Y. Utilities, 7% pf. | 108 | 103 | 109 |
| No. Ohio Pwr., com.—no par | 29¼ | 18 | 32 |
| Northern Ohio Pwr. & Lt., 6% pf. | 100 | 90 | 99 |
| No. Ont. Lt. & Pr. 6% pf. | *m*100 | 94 | 100 |
| No. States Pwr. (Del.), 7% pf. | 109 | 101 | 110 |
| No. States Pwr. (Del.), 8% com. | 143½ | 123 | 152 |
| No. Texas Elec., 6% pf. | 55 | 45 | 70 |
| No. Texas Elec., com. | 19 | .... | .... |
| **OHIO BRASS, com. B $4—no par.** | *m*93¼ | 89 | 100¼ |
| Ohio Brass, 6% pf. | *m*105 | 106 | 111 |
| Ohio Pwr., 6% pf. | 108 | 104 | 109¼ |
| Ohio Pub. Serv., $6 pf. | 104 | 95 | 105 |
| Ohio Pub. Serv., 7% pf. | 111 | 107 | 112 |
| Ohio River Edison, 7% pf. | 109¼ | 106 | 109¾ |
| Oklahoma Gas & Elec., 7% pf. | 114¼ | 106 | 115¼ |
| **PACIFIC Gas & ELEC., 6% pf.** | 28¼ | 26¼ | 30 |
| Pacific Gas & Elec., 8% new com. | 50¼ | 43¼ | 53¼ |
| Pacific Pwr. & Lt., 7% pf. | *l*110 | 106 | 110 |
| Packard Electric | *n* 67¼ | 47 | 68 |
| Penn Cent. Lt. & Pwr., $5 pf.—no par | *c* 81 | 79¼ | 82 |
| Penn-Ohio Edison, 6% pf. no par | 99½ | 93¼ | 100 |
| Penn-Ohio Edison, 7% pf. | 108 | 97¼ | 109 |
| Penn-Ohio Pwr. & Lt., 7% pf. | 110 | 99 | 112 |
| Penn Pwr. & Lt.—$7—no par | *l*110 | 109¼ | 110¼ |
| Penn Wtr. & Pwr., $2.50 com., new | *e* 85½ | 68 | 90 |
| Phila. Co., 5% pf.–50 | *m* 46½ | 45¼ | 48¼ |
| Phila. Co., 6% pf.—50 | 55 | 52 | 57 |
| Phila. Co., com.—50 | *m*170 | 145 | 174¾ |
| Phila. Elec., 8% com.—25 | *c* 74½ | 55¼ | 74¾ |
| Portland Elec. Pwr., 7% pf. | 105 | 100 | 104¼ |
| Portland Elec. Pwr., 6% pf. | 95 | 78 | 96 |
| Portland Elec. Pwr., 6% 2d pf. | 83 | 55 | 88 |
| Portland Elec. Pwr., com. | 43 | 42¼ | 52 |
| Potomac Elec. Power, 6% pf. | *m*111 | 110 | 111¼ |
| Pwr. Sec., pf.—no par. | 66 | 60 | 74 |
| Pwr. Sec., com.—no par. | 13¼ | 11¼ | 14¼ |
| Public Serv. of Colorado, 7% pf., | 108 | .... | .... |
| Pub. Serv. of N. J., 6% pf. | *m*113½ | 103¼ | 115 |
| Pub. Serv. of N. J., 7% pf. | 129 | 118 | 129¼ |
| Pub. Serv. of N. J., $2 com.—no par | 61 | 41¼ | 66¼ |
| Pub. Serv. of No. Ill., 6% pf. | *a*112 | 110 | 115 |
| P. S. of No. Ill., com. $8—no par. | *a*185 | 159½ | 190¼ |
| Pub. Serv. of No. Ill., $8 com. | *a*185 | 159¼ | 190 |
| Pub. Serv. of Okla., 7% pr. in. | 109 | 100 | 107 |
| Pub. Serv. Elec. & Gas, 6% pf. | 109¼ | 108 | 110¼ |
| Puget Sound Pwr. & Lt., 7% pf. | *m*110 | 105 | 109 |
| Puget Sound Pwr. & Lt., $6 pf.—no par | 101¼ | 92 | 105¾ |
| Puget Sound Pwr. & Lt., com. | 71¼ | 34¼ | 84¼ |
| **RADIO CORP. OF AMER., $3.50 pf.—50** | 57¼ | 54¼ | 60 |
| Radio Corp. of Amer., com.—no par. | 211¼ | 85¼ | 211¼ |
| Rochester Gas & Elec. 6% pf. D | *m*104 | 105¼ | 106½ |
| Rochester Gas & Elec., 7% pf. B. | 107½ | 105 | 107 |
| Rochester Gas & Elec., 6% pf. C. | *m*104 | 105¼ | 106¼ |
| **SAN JOAQUIN Lt. & Pwr., 7% pr. pf.** | 117 | 110 | 117½ |
| St. Joseph Ry., L., H. & P., 5% pf. | *m* 75 | 70 | 75 |
| Servel, Inc. | 15¾ | 4¼ | 17¼ |
| Sierra Pacific Elec., 2% com. | 36¼ | 29 | 40¼ |
| Sioux City Gas & Elec., 7% pf. | 107 | 100 | 108¼ |
| Southeastern Pwr. & Lt., pf.—$7 no par | *i* 109 | .... | .... |
| Southeastern Pwr. & Lt., ptc. pf. | *i* 89¼ | .... | .... |
| Southeastern Pwr. & Lt., com.—no par | 57¼ | 40¼ | 61 |
| So. Calif. Edison, 8% pf. | 49 | 38¼ | 41 |
| So. Calif. Edison, 7% pf. | 29¾ | 28¼ | 30 |
| So. Calif. Edison, 6% pf. | 27¼ | 25¼ | 27¼ |
| So. Calif. Edison, 8% com. | 50¼ | 43¼ | 53¼ |
| Southern Cities Utilities, 7% pf. | 85 | 75 | 92 |
| Southwestern Lt. & Pwr., A $3. | 80 | 60 | 80 |
| Southwestern Lt. & Pwr., B. | 70 | .... | .... |
| Southwestern Lt. & Pwr., $6 pf. | 94¼ | 88 | 96¼ |
| Southwestern Pwr. & Lt., 7% pf. | *m*112 | 103 | 115 |
| Standard Gas & Elec., 8% pf. | *m* 71 | 65 | 71¼ |
| Standard Gas & Elec., 7% pr. pf. | 114 | 108 | 115 |
| Standard G. & E., com. $3.50 | 69¼ | 57¼ | 74¼ |
| Standard Power & Light, com. | 58¼ | 29¼ | 58¼ |
| Standard Pwr. & Lt., 7% pf. | *m*106 | 98 | 106 |
| Staten Island Edison, pf.—$6—no par | 102 | 99 | 103¼ |
| Superheater, $6 com.—no par | 150 | 155 | 178 |
| Syracuse Lighting, 7% pf. | 110 | 103 | 112¼ |
| Syracuse Lighting, 8% pf. | *m*117 | 114 | 119 |
| **TAMPA ELEC., com. $2** | *m* 68 | 62 | 71 |
| Tenn. Elec. Pwr., 6% pf. | 102½ | 92 | 103 |
| Tenn. Elec. Pwr., 7% pf. | 109½ | 107 | 110 |
| Tex. Pwr. & Lt., 7% pf. | *l*113¼ | 113¼ | 115 |
| Tide Water Pwr., 8% pf. | 110 | 108 | 112 |
| Timken Roller Bear., com.—$4 no par | 128¼ | 112¼ | 134 |
| Toledo Edison, 7% pf. | 109¼ | 103 | 113 |
| Toledo Edison, 6% pf. | 105 | 95 | 105 |
| Toledo Edison, 6% com. | *m*145 | 120 | 150 |
| Tri-City Ry. & Lt., 6% pf. | 90 | 88 | 102 |
| **UNITED GAS & ELEC., 7% pf.** | 97 | 98 | 103 |
| United Gas & Elec. (N. J.), 5% pf. | 75 | 70 | 77 |
| United Gas Impr., 8% com.—50 | *c*148¼ | 114¼ | 149¼ |
| United Lt. & Pwr., pf.—$4—no par. | *m* 56¼ | 49 | 56¼ |
| United Lt. & Pwr., pf.—$6.50—no par | 101¼ | 94¼ | 103¼ |
| United L. & P., com. A .48—no par | 25¾ | 13¼ | 26¼ |
| United L. & P., com. B .48—no par. | *m* 25 | 16 | 30 |
| Utah Pwr. & Lt., 7% pf. | *l*111 | 109¼ | 112 |
| Utica Gas & Elec., 7% pf. | 105 | 105 | 106¼ |
| Utica Gas & Elec., 8% com. | *m*200 | 215 | 225 |
| Utilities Pwr. & Lt., 7% pf. | 103¼ | 98 | 103 |
| Utilities Pwr. & Lt., com. A $2 | 42¼ | 28¼ | 44¼ |
| Utilities Pwr. & Lt., com. B $1—no par | 29¼ | 18¼ | 30¼ |
| **VERMONT HYDRO-ELEC., 7% pf.** | 99 | 95 | 102 |
| Virginia Elec & Pwr., 7% pf. | *m*110½ | 108 | 111 |
| Virginia Public Service 7% pf. | 102¼ | 97 | 103¼ |
| **WAGNER ELEC., 7% pf.** | *b*106½ | 96¼ | 106½ |
| Wagner Elec., com.—no par | *b* 86¼ | 37 | 120 |
| Washington Ry. & Elec., 7% com | *m*470 | .... | .... |
| Washington Ry. & Elec., 5% pf. | *n*100¾ | .... | .... |
| Washington Wtr. Pwr., 8% com. | 225 | 175 | 235 |
| West Penn Elec., 7% pf. | 113¼ | 109¼ | 115 |
| West Penn Elec., Cl. A $7 | 110 | 106½ | 112 |
| West Penn Pwr., 7% pf. | 115¼ | 114¾ | 117 |
| West Penn Pwr., 6% pf. | *m*110½ | 108¼ | 113 |
| West Virginia Lt., Ht. & Pwr., 7% pf. | 95 | 94 | 100 |
| Western Pwr., 7% pf. | 104 | 98 | 105 |
| Western States Gas & Elec., 7% pf. | *m*104 | 100 | 106 |
| Western States Gas & Elec., com. | *m* 38 | .... | .... |
| Westinghouse Elec. & Mfg., 8% com.—50 | 104¾ | 88¼ | 112 |
| Weston Elec. Instrument, Cl. A $2—no par | *m* 33 | 30¼ | 34 |
| Weston Elec. Instrument, com.—no par | 18¼ | 12¼ | 18¾ |
| Wheeling Elec., 6% pf. | 106 | 95 | 109 |
| Worthington Pump, 7% pf. A | *m* 57¾ | 46¼ | 58¼ |
| Worthington Pump, 6% B. | 49 | 41 | 51 |
| Worthington Pump, com. | 34¼ | 28 | 37¼ |
| **YALE & TOWNE com. $5—25.** | 74¼ | 68¼ | 84¼ |

Stock Exchange: *a*Chicago; *b*St. Louis; *c*Philadelphia; *d*Boston; *e*Baltimore; *f*Montreal; *g*Cincinnati; *h*San Francisco; *i*Pittsburgh; *j*Washington; *k*Cleveland. *l*Bid price Tuesday, May 29. *m*Bid price Saturday, May 26. *n*Latest quotations available. †Dividend rate variable.

ence of regional conditions on the amount of installation required to produce a given annual output is evident.

## Electric Power in Canada

Almost 99 per cent of the electrical energy output of central stations in Canada in 1926 was hydro-electric, according to a preliminary report on the census of the central-station industry for 1926 recently issued by the Dominion Bureau of Statistics. The energy output was 19 per cent greater in 1926 than in 1925, the rapid growth being due in considerable degree to the pulp and paper and to the mining industry. The estimated horsepower purchased by the former from central stations shows an increase of more than 160 per cent between 1922 and 1926. Most of this is 24-hour power. The numerous small fuel plants were more important than their 1 per cent of the output would imply, by serving 57,000 customers.

The report gives data relating to the individual provinces as well as numerous statistical items for the industry in Canada as a whole, only a few of which can be here quoted.

GROWTH OF CENTRAL STATION INDUSTRY IN CANADA

| | 1926 | 1925 |
|---|---|---|
| Power plants, number | 595 | 563 |
| Hydraulic, number | 294 | 284 |
| Fuel, number | 301 | 279 |
| Capital | $756,220,066 | $726,721,087 |
| Revenue | 88,933,733 | 79,341,584 |
| Salaries and wages | 19,943,000 | 18,755,907 |
| Employees, number | 13,406 | 13,263 |
| Pole-line, mileage | 29,695 | 27,653 |
| Transmission | 10,645 | 9,791 |
| Distribution | 19,050 | 17,862 |
| Customers, number | 1,337,562 | 1,279,731 |
| Energy generated, thousands kw.-hr. | 12,09,445 | 10,110,459 |
| Hydro, thousands kw.-hr. | 11,911,039 | 9,941,604 |
| Fuel, thousands kw.-hr. | 173,600 | 160,979 |
| Prime movers, horsepower | 3,769,323 | 3,569,527 |
| Waterwheels and turbines, horsepower. | 3,609,385 | 3,416,018 |
| Steam engines, horsepower | 36,386 | 24,230 |
| Steam turbines, horsepower | 103,847 | 101,457 |
| Internal combustion engines, horsepower | 19,705 | 17,822 |
| Generators, kva. | 2,995,387 | 2,844,709 |

# Business News and Market Conditions

## Economic Progress Reviewed by Industrial Board

A review of today's most pressing business problems and of the contributions of science and engineering to economic progress was the outstanding feature of the twelfth annual meeting of the National Industrial Conference Board, held in New York, May 17. Particularly notable were addresses by Gilbert H. Montague, declaring that the Sherman law was being satisfactorily modified by interpretation, and by Charles H. Herty on the great contribution that chemistry has made to economic progress. Prof. Michael I. Pupin praised the college professor as the father of the electrical industry and the creator of that scientific idealism which he pictured as a proper policy for industry.

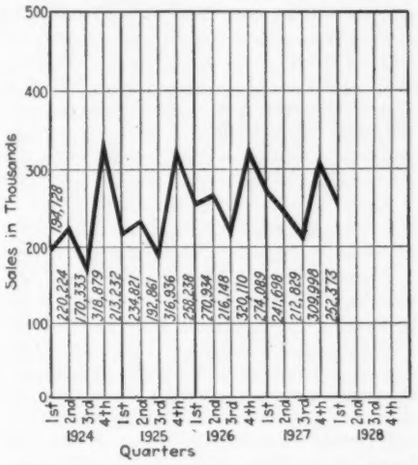
Mr. Montague, a New York attorney who is an authority on the Sherman law, declared that legislation was being constantly modified by the increasing liberality of court decisions on consolidations and combinations, by action of the Federal Trade Commission and by a liberal attitude on the part of the Department of Justice. He declared emphatically that it was not true that American business cannot thrive under the present anti-trust laws. He believes that the modifications are such and the tendency so liberal that we should not attempt to tamper with the Sherman law by amendment and thus set up additional bureaucratic machinery and create unsettlement until the meaning of the new amendments can be determined. He heartily recommended two books on combinations and consolidations publishd by the National Industrial Conference Board, and a third, now in press, to be put out by the same organization.

Magnus W. Alexander, president of the board, discussed thoroughly the various estimates of unemployment put out during the last six months, showing how the various figures were built up and proving the unreliability of the figures of 4,000,000 and more unemployed. He made a satisfactory defense, also, of the thesis that the mechanization of industry should not be curtailed because of any temporary effect it might have on the unemployment problem.

Virgil Jordan, chief economist of the board, made the point that those who expect our private foreign loans to be repaid when due are sure to be disillusioned. He believes that these loans will be funded and refunded indefinitely, just as are the bonds of large corporations in the United States. This he held to be the normal expectation. Nevertheless, our large loans abroad set up a new financial relationship between the rest of the world and the United States—a relationship into which we were thrust in the very brief four years of the war and for which, therefore, we have had no preparation in the way of adequate experience in international finance. The resulting problems are intricate and difficult. They must have the very deepest study by industrialists and business men. Otherwise we shall learn by bitter experience.

Loyall A. Osborne, president of the Westinghouse Electric International Company, was re-elected chairman of the board and Magnus W. Alexander president and chief executive of the organization. The other officers are as follows: Vice-chairmen, Charles Cheney, president Cheney Brothers, South Manchester, Conn.; Irenée du Pont, chairman finance committee E. I. du Pont de Nemours Company, Wilmington, Del.; Herbert F. Perkins, first vice-president International Harvester Company, Chicago; George S. Harris, president Exposition Cotton Mills, Atlanta, Ga.; treasurer, Fred I. Kent, director Bankers Trust Company, New York. The executive committee will be composed of the officers of the board and the following members: William D. Baldwin, chairman Otis Elevator Company; A. Farwell Bemis, chairman Bemis Brothers Bag Company, Boston; Cornelius F. Kelley, president Anaconda Copper Mining Company, New York, and William H. Nichols, Jr., president General Chemical Company, New York.

### Vacuum-Cleaner Sales




Vacuum-cleaner sales by quarters during 1924, 1925, 1926, 1927 and the first quarter of 1928. (Data supplied by Vacuum Cleaner Manufacturers' Association.)

## Helium Now Available in Commercial Quantities

Helium, heretofore a rare element and not obtainable in the open market, is now available in commercial quantities. Although the most important use of helium is for inflating dirigible and passenger balloons, it has an increasing use in industry. It is being used for filling radio tubes and glow lamps and tubes for signs and as a cooling medium in

### *Imports of Electrical Apparatus Into the United States by Commodity and by Country of Origin for the First Quarter of 1928*

(Data furnished by the Bureau of Foreign and Domestic Commerce)

| Article | First Quarter |
|---|---|
| Carbon-filament incandescent electric lamps: | |
| Miniature | $64,450 |
| Other lamps | 79,492 |
| Metal-filament incandescent electric lamps: | |
| Miniature | 3,053 |
| Other lamps | 24,052 |
| Other electric lamps, including neon, etc. | 482 |
| Generators | 77 |
| Transformers | 757 |
| Converters, double-current and motor-generators, dynamotors and other converting apparatus | ..... |
| Switches, circuit breakers, fuses, choke coils, reactors, sockets, plugs, etc | 491 |
| Motors, stationary, railway, vehicle, automotive, and other | 112 |
| Electric fans and blowers | 262 |
| Table household, kitchen and hospital utensils and similar hollow or flat ware containing electrical heating element: | |
| Electric flatirons | 6 |
| Iron or steel-enameled or glazed with vitreous glasses | 653 |
| Copper, brass, steel or other base metal | 300 |
| Industrial electric furnaces and ovens | ..... |
| Therapeutic apparatus and X-ray machines | 6,331 |
| Radio and wireless apparatus and parts | 51,904 |
| Telegraph apparatus | 1,076 |
| Telephone apparatus | 1,337 |
| Storage batteries and parts | 2,934 |
| Batteries other than storage | 1,363 |
| Electrical machinery and parts | 207,543 |
| Electric apparatus and parts | 81,169 |
| Total | $527,844 |

| Country | First Quarter |
|---|---|
| Austria | $8,283 |
| Australia | 3,784 |
| Azores and Madeira Islands | ..... |
| Belgium | 21 |
| Brazil | 18 |
| British Honduras | 10 |
| British West Indies | ..... |
| Canada | 5,991 |
| Ceylon | ..... |
| China | 3,486 |
| Cuba | 247 |
| Czechoslovakia | 1,354 |
| Denmark | 53 |
| France | 11,863 |
| French Oceania | ..... |
| Germany | 163,975 |
| Hungary | ..... |
| Irish Free State | ..... |
| Italy | 2,932 |
| Japan | 90,429 |
| Mexico | 100 |
| Netherlands | 2,744 |
| Norway | 525 |
| Philippine Islands | ..... |
| Portugal | 6 |
| Rumania | ..... |
| Spain | ..... |
| Sweden | 119,328 |
| Switzerland | 54,381 |
| United Kingdom | 58,314 |
| Total | $527,844 |

electric transformers and high-speed generators. It also is used as a non-oxidizing gas in annealing processes and metallurgical operations, and as a damper for scientific instruments because of its high viscosity.

Helium has been made available commercially by the discovery of new natural gas fields having a higher helium content and the development of an improved process of extraction by the Helium Company, whose plant is at Dexter, Kan., with headquarters at Louisville, Ky.

# Market Conditions

BUYING is reported at a satisfactory level in the industry. Industrial business is good and inquiries presage future sales. Fractional-horsepower motor sales are said to be exceeding expectations largely owing to the increased demand for domestic appliances. Important projects include a can manufacturing plant at Chicago to cost more than $500,000; a new rayon mill near Richmond, Va., to cost $1,500,000, and a paperboard mill at Baltimore, Md., to cost $300,000.

In New England buying is at a good level and small motors are in demand. Maine and New Hampshire plants were active in ordering poles and line material. Industrial plant business looms up as the important factor in business in the Eastern district. Sales of industrial control apparatus are reported by one manufacturer as about 5 per cent better than they were last year. The demand for street-lighting equipment has improved in the New York metropolitan district, Buffalo, Philadelphia and Chicago. In the Southeast a good volume of business made up of many small orders is reported. A steel mill in Alabama ordered $65,000 worth of motor equipment and a bleachery in South Carolina purchased $15,000 worth of apparatus. Another bleachery plant to be built in South Carolina calls for an expenditure of $2,000,000, of which amount $300,000 will cover the electrical installation. A decidedly better tone is noted in the St. Louis district, and manufacturers report more business in sight. An order for two turbine units amounted to $80,000. Industrial business is better in the Middle West and conditions continue to improve. On the Pacific Coast many pole and crossarm inquires are reported including one for $50,000. Pump and motor business especially has been good owing to flood conditions in eastern Washington and Idaho.

## *Expansion of Sales Noted in Eastern District*

Sales continue on a satisfactory basis in the Eastern district, with industrial sales maintaining the lead over central-station and affiliated business. There is a pronounced demand for motors in larger sizes up to 250 hp. from iron and steel plants, textile mills and cement mills, with the New England district a prominent factor in commitments. Inquiries are holding up well for early future sales. Business in fractional-horsepower motors is said by one manufacturer to be exceeding all expectations for the year. There has been a marked increase in sales for talking machines, washing machines and other domestic appliances, and the first six months of 1928 will show an encouraging advance over the corresponding period a year ago. A water company at Pittsburgh, Pa., has placed an order for a turbo-generator unit to cost about $50,000, for a pumping station installation, and Evansville, Ind., has contracted for a 750-hp. geared turbine unit for extensions in its municipal waterworks.

Transformer business has been advancing for the past few weeks, with industrial commitments on a good level. Central-station business in that line shows a little decline, with utilities in the metropolitan district now coming into the market. A leading manufacturer reports an order from a hospital in northern New York for transformer with switchboard panel, etc., to cost close to $20,000. A maker of industrial control apparatus says that sales for the present year are running at 5 per cent or better than the average for the same period in 1927, with the gain particularly noticeable in the New York and Philadelphia districts. Construction operations in the Eastern district include the following:

Hansen's Laboratory, Inc., Little Falls, N. Y., manufacturer of food products, will build an addition to cost about $300,000. The American Enka Corporation, New York, plans a power plant at its proposed rayon mill near Richmond, Va., to cost $1,500,000. The Corn Products Refining Company, New York, plans a refining plant in Sao Paula, Brazil, to cost $1,000,000. Automotive Standards, Inc., New York, has purchased property with buildings at Newark, N. J., for plant to cost $400,000. The Public Service Electric & Gas Company, Newark, N. J., is securing a right-of-way for a proposed transmission line in Essex, Union and Middlesex Counties. The Direct Ink Ribbon Company, Camden, N. J., plans a plant to cost $85,000. Harrisburg, Pa., is asking bids until June 7 for fire alarm and police cable lines.

The Pennsylvania Railroad Company is carrying out a shop expansion program at Wilmington, Del., to cost $200,000, and will remove Pavonia shops at Camden, N. J., to that location. The Bureau of Supplies and Accounts, Washington, D. C., will receive bids until June 5 for generator units, impulse cable assemblies, etc., for Philadelphia navy yard (Schedule 9111). The Chesapeake Paper Board Company, Baltimore, Md., will ask bids about June 15 for a new addition to cost $300,000. The U. S. Coast and Geodetic Survey, Washington, D. C., will receive bids until June 22 for construction of a steel Diesel-electric propelled survey ship of about 770 tons displacement; separate bids will be received at the same time for furnishing main propelling machinery, pumps, windlass, capstan, boat hoist, etc.

## *Prices of Copper, Lead and Zinc Advance*

Copper has sold in excellent volume and now appears to be firmly established at 14¾ cents, Connecticut Valley. More than usual activity in lead is reported and the New York price is now 6.30 cents compared with 6.10 cents a week ago. Buying of zinc has been almost non-existent, but some sellers are asking 6.15 cents and there is no inclination on the part of producers to make concessions. For the sixth consecutive week copper has sold in excellent quantity.

**NEW YORK METAL MARKET PRICES**

| | May 23, 1928 Cents per Pound | May 29, 1928 Cents per Pound |
|---|---|---|
| Copper electrolytic | 14.375 | 14.525 |
| Lead, Am. S. & R. price | 6.10 | 6.30 |
| Antimony | 11.125 | 11.0 |
| Nickel, ingot | 35 | 35 |
| Zinc spots | 6.475 | 6.475 |
| Tin, Straits | 51.625 | 50.625 |
| Aluminum, 99 per cent | 24.30 | 24.30 |

Base copper wire price May 29, 1928, 16½ cents.

## *Industrial Business Better in Middle West*

General business in the Middle West continues to improve. Industrial activity is not quite as spotty and with the stiffening up of the metal market, better business conditions are anticipated. The railroads report a varied movement of commodities and some hope is evidenced recently with regard to the coal situation. Employment conditions have improved somewhat. Interesting orders placed by utility companies included evaporator equipment, a feed water heater, a revolving car dumper, six induced draft fans, one railroad track scale and 500,000 lb. of bus bar copper. Construction projects are as follows:

The Mills Novelty Company, Chicago, plans a plant for coin machine manufacture, to cost $100,000. The Harrisburg Packing Company, Harrisburg, Ill., plans a packing plant to cost $100,000. The Construction Division, Veterans' Bureau, Washington, D. C., will receive bids June 12, for ash-handling equipment for hospital at Maywood, Ill. The Iowa Public Service Company, Ft. Dodge, Iowa, plans improvements in the power plant at Charles City, Iowa, to cost $100,000. Chillicothe, Iowa, plans a municipal power system. The Detroit Edison Company, Detroit, Mich., will build additions to power substations at Cortland, Grand River, Amsterdam, and Hart, to cost $200,000. The Detroit Macaroni Manufacturing Corporation, Detroit, Mich., will build a plant, to cost $175,000. The O. B. McClintock Company, Minneapolis, Minn., manufacturer of fire and burglar alarm systems, etc., plans a plant to cost $80,000.

The Zinsmaster Baking Company, Minneapolis, Minn., will build a baking plant

to cost $170,000. The Great Northern Railway Company, St. Paul, Minn., plans a call for bids for the power plant and repair shops at Fargo, N. D., to cost $100,000. The Cleveland, Cincinnati, Chicago, & St. Louis Railroad Company plans repair shops at Bellefontaine, Ohio, to cost $155,000. The Contracting Officer, Material Division, Air Corps, Wright Field, Dayton, Ohio, will receive bids June 5, for 763 generator units (Circular 333). The Lakeside Cheese Company, Plymouth, Wis., will build a plant at Loyal, Wis., to cost $100,000. The Madison Silo Company, Madison, Wis., plans a plant to cost $75,000. The Hudson Manufacturing Company, Minneapolis, Minn., plans a plant for the manufacture of barn and dairy equipment at Waukesha, Wis., to cost $60,000. St. Paul, Minn., plans an ornamental lighting system on Concord Street. The town clerk, Afton, Iowa, will receive bids until June 15, for an electrical distribution system.

## *Active Business Reaches Good Volume in Southeast*

Satisfactory activity is reported in the electrical field in the Southeast with the volume sustained by increased small business. A power company in Georgia ordered bare and weather-proof copper wire amounting to $15,500, while a company in Tennessee placed orders for a 3,000-kva. transformer and distribution transformers amounting to $3,000. A small company in Georgia ordered small power transformers amounting to $2,500, while another company in the same state purchased small power and distribution transformer equipment totaling $3,600. A central-station company recently purchased control batteries costing $6,000. The demand for control batteries is active.

A steel mill in Alabama ordered motor equipment amounting to $65,000 and a bleachery plant in South Carilona purchased dyeing and bleaching equipment costing $15,000. A cotton mill in Georgia bought pole line materials amounting to $5,000 for use in its mill village distribution system, and an automobile assembling plant in the same state purchased an industrial truck costing approximately $5,000. Engineering contract was closed this week for a finishing plant and bleachery to be constructed in South Carolina, the plant to represent an expenditure of $2,000,000 with approximately $300,000 going into the electrical installation. Engineers are also at work on a 20,000-spindle cotton mill for Tennessee. Construction projects are as follows:

The Gulf Fertilizer Company, Tampa, Fla., plans a mill to cost $150,000. The Gentile Brothers Packing Company, Haines City, Fla., plans a cold storage plant with new fruit canning factory to cost $100,000. The Sixth Vein Coal Company, Madisonville, Ky., plans expansion in properties to cost $75,000. The B. V. May Hosiery Mills, Inc., Burlington, N. C., will build an addition to cost $400,000. The Atlantic Ice & Coal Company, Atlanta, Ga., plans an ice plant at Knoxville, Tenn., to cost $100,000. The Virginia Public Service Company, Charlottesville, Va., is negotiating for the purchase of the municipal plant at Staunton, Va. Huntsville, Ala., plans an ornamental lighting system.

## *Buying in New England at a Good Level*

Industrial sales volume showed improvement in the New England district, with small motor sales at a high level. An interesting order amounting to over $80,000 was reported. A number of industrial plants are equipping on a fairly extensive scale. A paper company recently placed an order for motors and control amounting to over $40,000, and a number of smaller orders are recorded. Small switch sales are good and negotiations have increased, particularly concerning heavy power apparatus.

Central-station supplies are moving well. Orders for poles and line material lead with buying active among Maine and New Hampshire plants. During the past week transmission line equipment sales increased. Projects for electric lighting are increasing, and street lighting is active. Boston plans to expend $125,000 for electric automatic progressive timing traffic signals. Interest in structural welding is increasing. Jobbing conditions are uneven. Electric ranges are in strong demand. Construction projects are as follows:

The New York, New Haven & Hartford Railroad Company has acquired a tract of land at John and Water Streets, New London, Conn., and plans a power plant. The Connecticut Power Company, New London, Conn., plans an equipment storage and distributing plant at Waterford, Conn., to cost $40,000.

## *Decidedly Better Tone Noted in St. Louis*

General conditions show an improvement in the St. Louis district. An order was placed for two turbo-generator units for the western part of the district at a cost of $80,000. The St. Louis water department bought a lot of electric driven service pumps amounting to $7,000. Another order from a paper company for motors and control apparatus amounted to $6,000. There is an increasing demand for line construction materials which are being shipped mostly to the southwestern part of the district. Manufacturers report more business in prospect and a decidedly better tone throughout the district, particularly in the south and west. Construction projects are as follows:

The Ward Furniture Manufacturing Company, Fort Smith, Ark., will build a factory to cost $85,000. The Barnes Dairy Products Company, Rogers, Ark., plans a milk plant to cost $65,000. The United States Engineer Office, New Orleans, La., is taking bids until June 6, for one electric-driven air compressor complete (Circular 265). The Shreveport Packing Company, Shreveport, La., plans a packing plant to cost $80,000. The Meeker Advertising Company, Joplin, Mo., plans a factory for the manufacture of display equipment, to cost $100,000. The St. Louis Electric Terminal Railway, St. Louis, Mo., plans a terminal and freight building to cost $1,000,000.

Stanberry, Mo., plans the installation of a municipal power plant. The General Baking Company, New York, N. Y., plans a baking plant at Oklahoma City, Okla., to cost $175,000. The Texas Company, Houston, Tex., plans expansion in the Port Arthur oil refinery to cost $3,000,000. The Arkansas-Missouri Power Company, Blytheville, Ark., has secured franchise at Blytheville, Ark., and plans extensions in transmission lines. The Arkansas Power & Light Company, Little Rock, Ark., will build a 33,000-volt transmission line between Gurdon and Camden, Ark. Durant, Okla., plans extensions in its ornamental lighting system.

## *Business in Good Volume on Pacific Coast*

Many pole and crossarm inquiries are reported on the Pacific Coast. They are mainly for carload shipments to various points. An inquiry of the Pacific Gas & Electric Company, approximates $50,000, and another covers 1,000 assorted treated poles, mainly 30 ft. and 35 ft., for the Hawaiian Islands. The Southern Pacific Company has just completed the installation of four selective teletype printers in the Los Angeles yard to record train departures and contemplate similar installations in San Francisco and Oakland. The electrical material is valued at about $7,500 per job. Motor orders for industrials are good typical orders though larger than average.

Flood conditions in eastern Washington and Idaho, occasioned by melting snow in the mountains preceded by heavy rains, brought considerable pump and motor business to dealers in Spokane, Seattle and Tacoma. Other sales reported include about 75 motors from 100 hp. down for sawmills and allied industrials; 6 2,500-kva. transformers for track substations for the Great Northern Railway in the Wenatchee Valley; 3 55,000-volt oil circuit breakers and a number of 15,000-volt breakers for a central-station company in the Puget Sound district. Construction projects are as follows:

Cold storage plants are planned for Wenatchee and Yakima. Paper bag factories are planned in Vancouver, Wash., and St. Helens, Ore. The Centralia Lumber Company plans a large manufacturing plant. The North Corona Land Company, 528 South Hill Street, Los Angeles, plans a steam power plant at Norco, Calif., to cost $130,000. Sacramento, Calif., plans installation of underground conduit system for all street lights. The Union Ice Company, San Francisco, plans an ice plant at San Jose, Calif., to cost $200,000. W. L. Soens, Durango, Colo., and associates have applied for permission to build a hydro-electric power plant at Bayfield, Ignacio, and vicinity, to cost $200,000. The Weyerhaeuser Lumber Company, Tacoma, Wash., plans a lumber mill near Klamath Falls, Ore., to cost $400,000.

Centralia, Wash., has applied for permission to build a hydro-electric plant on the Skookumchuck River, to cost $300,000. The Puget Sound Power & Light Company, Seattle, Wash., has a permit for a switching station. The Great Northern Railroad Company, Seattle, Wash., plans improvements in shops at Interbay yard, to cost $400,000. Sellers & Stone, Inc., Yakima, Wash., will build a cold storage plant for railroad car service to cost $150,000. The Pacific Gas & Electric Company, San Francisco, will make extensions in

transmission lines between San Rafael and Petaluma, Calif. The Commonwealth Utilities Corporation, Colorado Springs, Colo., plans a transmission line to the municipal airport, Calhan and vicinity. Morton, Wash., will build a transmission line from La Grande, in co-operation with the Rainier National Park. Los Angeles and Santa Cruz, Calif., plan ornamental lighting systems.

# Activities of the Trade

## New Merger Groups Makers of Transmission Material

The National Electric Products Corporation has been organized and has acquired the business of the National Metal Molding Company of Pittsburgh and Economy, Pa., the American Copper Products Corporation of Bayway, N. J., and the British American Metals Company of Plainfield, N. J. The National Metal Molding Company manufactures rigid conduit, outlet boxes and fittings, metallic and non-metallic flexible conduit, armored and rubber-covered cables and wires and metal molding. The American Copper Products Corporation makes bare copper wire and rods, weatherproof wire and transmission cable. The British American Metals Company manufactures condenser tubes and brass and copper pipe. The new organization thus becomes a large copper-consuming unit. Through its subsidiaries the new company also holds the majority of the stock of the Habirshaw Cable & Wire Corporation with mills at Yonkers, N. Y., and Bridgeport, Conn.

The new organization states that the grouping makes up a combination of non-competitive manufacturers whose products or lines are more or less supplemental and which in their entirety may be described broadly as covering an entire industry. The National Electric Products Corporation has been formed under the laws of Delaware with an authorized capital stock of 300,000 shares of no par value common and $5,000,000 of 6 per cent cumulative dividend preferred stock. None of the preferred stock will be issued at this time and there will be no public offering of the stock. The officers of the new corporation are: W. C. Robinson, chairman of the board; Wylie Brown, president; F. S. Jerome, treasurer; I. A. Bennett and H. H. Robinson, vice-presidents, and A. L. Robinson, treasurer. The board of directors will consist of all of the officers and O. F. Felix and C. F. Holdship of Pittsburgh, H. C. Carpenter of Elizabeth, N. J., and C. J. Gleason of New York.

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THE IDEAL COMMUTATOR DRESSER COMPANY, Sycamore, Ill., announces that it has improved and added many special attachments to the Ideal combination blower and suction devices.

THE NATIONAL ELECTRIC HEATING COMPANY, Boston, manufacturer of "Nehco" industrial electric heating equipment, announces the opening of an office in the Graybar Building, 420 Lexington Avenue, New York City, in charge of Robert A. Carleton. E. S. Guild, formerly chief engineer of the Carleton-Mace Engineering Corporation, has joined the organization as electrical engineer and Fred V. Hadley has been appointed New England representative with offices at 127 Federal Street, Boston.

## Altorfer Bros. Makes Large Shipments of Washers

For the second time in three weeks a train load of ABC washers, running as a special extra fast freight, was dispatched from the Altorfer Bros. Company factory in Peoria, Ill. The first train load was sent to the Southwest while the second went to the Eastern market. Early last year the Altorfer Bros. Company brought out, under the trade name "ABC Spinner," a washer with a porcelain tub. At the same time, to assure adequate production of a uniform, high standard porcelain, a complete porcelain department was installed at the factory, at a cost of approximately $250,000.

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THE ALLIS-CHALMERS MANUFACTURING COMPANY, Milwaukee, announces that its Grand Rapids, (Mich.) branch office has been moved to 310 Building and Loan Building. This office is in charge of G. C. Culver.

THE EXCEL ELECTRIC COMPANY, Muncie, Ind., manufacturer of home electric appliances, announces that A. C. Crandall has been made sales manager. Mr. Crandall was formerly with the Central Indiana Power Company of Indianapolis.

THE WAGNER ELECTRIC CORPORATION, St. Louis, announces that E. D. Pike is now manager of its San Francisco branch sales office. Mr. Pike has been with the company for twenty-six years and until recently was in charge of the company's Pacific coast service operation.

THE DAMPNEY COMPANY OF AMERICA, Hyde Park, Boston, manufacturer of "Apexior" protective coatings for power plant equipment, announces the appointment of C. J. Hunter as its Philadelphia district sales manager. Mr. Hunter will have offices in the Philadelphia Bourse Building and will look after the company's interests in eastern Pennsylvania, southern New Jersey, Delaware, eastern Maryland, District of Columbia and northern Virginia.

## Fulton Iron Works Buys Foos Engine Company

Following the acquisition of a substantial stock interest in the Foos Engine Company of Springfield, Ohio, the Fulton Iron Works Company of St. Louis has purchased the Foos company, using common stock of the Fulton company. The announcement that a substantial stock interest was acquired by the Fulton company was made in the Oct. 29, 1927, issue of the ELECTRICAL WORLD. The Foos Engine Company manufactures Diesel oil engines from 10 hp. to 300 hp. The Fulton company will operate the Springfield plant as a branch.

Harry J. Steinbreder, president of the Fulton concern, said that at the present time, exclusive of the Foos business the company has on hand sufficient orders to operate full capacity for the next four months. "Shipments for the company's fiscal year ending in June should exceed any one of the last five years and will in all likelihood be more than double the shipments of the last fiscal year," said Mr. Steinbreder.

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THE SILVRAY COMPANY, INC., 55 West Sixteenth Street, New York City, manufacturer of Silvray indirect bulbs and "Spraylite," announces the removal to its new and larger plant, located at 53 West Fourteenth Street, New York City, where four times the present capacity will be available.

THE BUFFALO FOUNDRY & MACHINE COMPANY, Buffalo, N. Y., manufacturer of "Buflovak" vacuum dryers, evaporators and chemical apparatus, announces the appointment of O. S. Sleeper as engineer in charge of special development work. Mr. Sleeper has for the past seven years conducted the O. S. Sleeper Company, manufacturing similar equipment.

THE OLIVER IRON & STEEL CORPORATION, Pittsburgh, announces the appointment of C. A. Heiser as district manager at Dallas, Tex., with headquarters at 409 Browder Street. Mr. Heiser, formerly assistant sales manager of the Southwest General Electric Supply Company at Dallas, will have charge of the line material, bolt, nut and rivet departments.

THE MCGRAW ELECTRIC COMPANY, Omaha, Neb., jobber, announces the purchase of the "Clark" electric water heater business from the Stoughton Manufacturing Corporation of Stoughton, Wis. The business will be conducted from the general office at Omaha and the manufacturing plant will be continued at Stoughton, Wis., by the designer of the Clark electric water heater. A. E. Julian, who will continue as sales manager of the water heater business, will move to Omaha, making his headquarters in the McGraw building. The executive management of the business will be under the direction of Arthur J. Cole, vice-president and general manager of the McGraw Electric Company.

# New Equipment Available

## Outdoor Potential Detector

A means of indicating potential on high-tension transmission lines at points where no potential transformers are used is a recent development by the Westinghouse Electric & Manufacturing Company. This is accomplished by means of a type O N static glow outdoor potential detector.

The detector consists of a vacuum type static glow lamp mounted in standard fuse clips and inclosed in a metal case having a glass window. It is suspended from the line conductor by a clamp in such a manner that the lamp is visible from the ground. One terminal of the glow lamp is connected to the line conductor through the clamp and the other is fastened to a brass rod antenna suspended from the case. The detector is applicable to line voltages from 4.5 kv. to 220 kv.

## High-Frequency Grinder

The addition of high frequency models to its line of grinders is announced by Forbes & Myers, Worcester, Mass. These new models are identical with the previous bench and floor type grinders made by the company with the exception that they are built to operate at higher speeds. The new grinders are now being built in sizes from ¼ hp. to 2 hp. for all commercial high frequencies and for maximum speeds of 12,000 r.p.m.

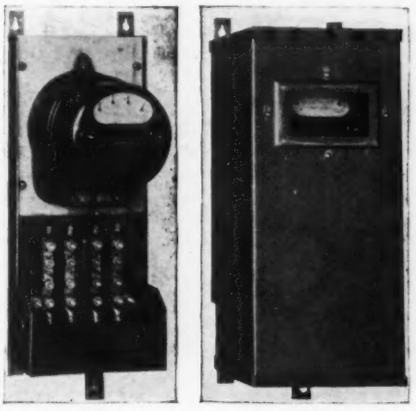
The motor is of the high frequency induction type with a long spindle, the motor armature and wheels being mounted directly on the spindle. It has four ball bearings, one close to each end of the spindle and one on each side of the motor. The space between the two bearings on each side of the motor is a large chamber for grease. The rotor is provided with aluminum bars and rings welded together. The company also manufactures a line of frequency changers for supplying these high frequency motors.

## Lever Operated Switch

A new switch, designed especially for splined shaft or shipper rod operation, is announced by the Cutler-Hammer Manufacturing Company, Milwaukee. This switch is for use as a pilot circuit control device on lathes, textile machinery and other equipment where starting and stopping of the machine is to be governed by a splined shaft, shipper rod or similar device. Low voltage protection is provided. Some of the features claimed by the manufacturer are: Non-stubbing contacts; shear pin to protect the mechanism; few parts and simple construction; operating lever which can be placed in any one of four operating positions 90 deg. apart, to suit any installation requirement; long, steel-to-bronze main bearing with oil hole; small size; fully inclosed in heavy steel case, and a cover which can be removed by loosening only two screws. The switch is designed especially for three-wire control, but also can be used for two-wire control on pilot circuits up to 550 volts.

## Outdoor Meter Box

A new type of meter box which makes it possible to mount residential meters out of doors for easy reading is announced by the Square D Company, Detroit, manufacturer of safety switches and other electrical control equipment. The case, finished in clear enamel, is of 16-gage steel, electrically welded, with a double strength window glass cemented in. The assembly includes a 60-amp. test block, a sealing stud at the bottom of the box, and a meter board of wood which permits the mounting of meters with differently spaced mounting holes. Two heavy steel strips are welded to the back of the box, offset to hold it away from the wall. The illustration shows the meter box with the cover removed and in place.



*Meter box which permits outdoor installation of watt-hour meter*

The distribution fuse box and service entrance switch are installed in the basement exactly as in the case of indoor metering. Service is brought from the pole directly to the meter box, which is mounted at the most convenient location on the outside wall of the house. The meter itself is protected, as the box is moisture-proof.

## Marine Type Instruments

A line of marine type ammeters and voltmeters, designed for use on shipboard or in mines or other locations where damp conditions may exist, has been developed by the Westinghouse Electric & Manufacturing Company. They operate on the D'Arsonval principle and are known as the type SX. Several features incorporated in these instruments are sapphire jewels, terminals in rear of instrument and accuracy within 1 per cent of full scale. The voltmeters have a range of 150 to 750 volts and the ammeters are available in a standard range of capacities from 50 amp. to 8,000 amp.

## Automatic Reclosing Feeders

A new line of automatic reclosing feeder equipment, arranged in the form of completely inclosed cubicles, has been placed on the market by the General Electric Company. These cubicles contain a circuit breaker and disconnecting switches, and are operated automatically by relays mounted on the front panel. The new cubicle construction has been designed to exclude dust and dirt from the operating parts, and to provide the feature of safety which is so important in the dead front type of switchboard apparatus now coming into use for inside installation.

Circuit breakers and disconnecting switches are mounted on a channel frame which also supports the walls of the cubicle. The front panel is arranged in the form of a door, and on it are mounted the necessary relays and meters for providing the automatic reclosing feature. On the back of this panel is located all of the control wiring, which is easily accessible. A rear door affords a means of conveniently inspecting breakers and all breaker parts. The cubicles are made in standard sizes and in ratings up to 7,500 volts. They may be arranged side by side to form a continuous switchboard of the completely inclosed type.

INSULATOR PINS.—A new series of pins known as the Locke "Redhead" and Locke "Leadhead" pins, has been placed on the market by the Locke Insulator Corporation, Baltimore. These pins consist of a cast-iron base with a steel through bolt and are intended for use with insulators having the standard 1⅜ in. N.E.L.A. pin hole. The "Redhead" pin is for use only with insulators having perfect metal threaded pin holes. The "Leadhead" pin may be used with these insulators or with any insulator having the 1⅜ in. standard N.E.L.A. pin hole.

PANELBOARD.—A new type of panelboard, known as the "Security," and which is of molded base unit construction, has been placed on the market by the Penn Electrical Company, Irwin, Pa. The fuse blocks are separate from the switch bases and the two types of fuse blocks are interchangeable. For instance, a panelboard arranged for cartridge fuses can be converted readily to a plug-fused panelboard. The line is made in the live face and safety construction types. The molded blocks will take either two double-fused circuits or four single-fused. The tumbler switches are of the heavy duty type and the switch plates are of molded bakelite.

# Electrical Patents

*Announced by U. S. Patent Office*

(Issued May 8, 1928)

1,669,039. ELECTRIC SOLDERING IRON; L. S. Brach, East Orange, N. J. App. filed Dec. 4, 1925.

1,669,082, 1,669,083. SYNCHRONOUS MOTOR; V. A. Fynn, St. Louis, Mo. Apps. filed June 12, and Aug. 2, 1926. Adapted to carry variable load at synchronous speed.

1,669,097. CONTROL OF ELECTRIC CIRCUITS; H. A. McCrea, Schenectady, N. Y. App. filed July 28, 1927. Providing for the disconnection of a faulty portion of a circuit.

1,669,099. AUTOMATIC ARC WELDING MACHINE; P. O. Noble, Fort Wayne, Ind. App. filed March 26, 1927.

1,669,106. ELECTRIC SWITCH; J. F. Tritle, Schenectady, N. Y. App. filed Dec. 6, 1924. "Trip free" type.

1,669,107. AUTOMATIC CONTROLLER; L. A. Umansky, Schenectady, N. Y. App. filed May 9, 1927. For the driving means of a driven element, the number of rotations of which it is desired shall bear a predetermined ratio to the number of rotations of another driven device.

1,669,109. INDUCTION FURNACE; J. M. Weed, Schenectady, N. Y. App. filed April 19, 1923.

1,669,113. STATOR CONSTRUCTION FOR DYNAMO-ELECTRIC MACHINES; A. P. Wood, Schenectady, N. Y. App. filed Feb. 19, 1927. Employing frame plates to clamp bars which engage the sides of the stator teeth to stiffen them so as to render the use of clamping covers unnecessary.

1,669,114. ELECTRIC HEATER; C. C. Abbott, Pittsfield, Mass. App. filed March 19, 1927. For ovens and the like.

1,669,120. COMBINED SWITCH AND PLUG RECEPTACLE; F. C. De Reamer, Bridgeport, Conn. App. filed May 8, 1923.

1,669,122. ELECTRIC SOCKET; J. B. Downing, East Orange, N. J. App. filed Oct. 6, 1924.

1,669,125. ELECTRIC SWITCH; H. G. Hartmann, Schenectady, N. Y. App. filed Feb. 1, 1924. Latching device for disconnecting switch.

1,669,126. SPOT WELDING; W. Hopp, Heiligensee, Germany. App. filed Feb. 7, 1927.

1,669,129. ELECTRODE; W. Irby, Lynn, Mass. App. filed Jan. 7, 1927. For use with the luminous type of arc.

1,669,132. SLIP-REGULATOR CONTROL; G. H. Jump, Buffalo, N. Y. App. filed June 21, 1926. For automatically regulating the slip of an alternating current motor so as to permit a flywheel or other inertia device connected with the motor to assist in carrying peak loads thrown on the motor.

1,669,134. MOLDED COMMUTATOR; H. T. Kelso, Fort Wayne, Ind. App. filed Dec. 3, 1927.

1,669,142. STATIC FREQUENCY CHANGER; M. Osnos, Berlin, Germany. App. filed Oct. 20, 1925.

1,669,147. VAPOR-ELECTRIC-ARC APPARATUS; C. A. Sabbah, Schenectady, N. Y. App. filed July 21, 1926.

1,669,148. ELECTRIC CONTROL SYSTEM; C. Schiebeler, Berlin, Germany. App. filed April 28, 1926. For hoisting installation.

1,669,149. PROTECTIVE ARRANGEMENT; O. C. Traver, Schenectady, N. Y. App. filed May 4, 1926.

1,669,150. SPEED REGULATION OF SYNCHRONOUS MOTORS; L. A. Umansky, Schenectady, N. Y. App. filed May 11, 1926.

1,669,154. PROTECTIVE RELAY; W. R. G. Baker, Schenectady, N. Y. App. filed Sept. 14, 1925.

1,669,157. ELECTRIC FUSE; G. R. Brown, Bridgeport, Conn. App. filed July 30, 1926. Inclosed fuse.

1,669,159. PHASE INDICATOR; R. D. Duncan, Jr., East Orange, N. J. App. filed July 21, 1925.

1,669,162. MOTOR-GENERATOR CONTROL; P. W. Forsberg, Schenectady, N. Y. App. filed Nov. 3, 1925. Sets employed in electric locomotive or similar service.

1,669,163. ELECTRICITY METER; J. Harris, La Fayette, Ind. App. filed Dec. 27, 1928.

Information on foreign patents can be obtained through the nearest district office of the Bureau of Foreign and Domestic Commerce, Department of Commerce.

1,669,177. ELECTRICITY METER; F. Scott, La Fayette, Ind. App. filed May 9, 1927.

1,669,190. CONDUIT FITTING; R. P. Dunmire, Erie, Pa. App. filed Oct. 30, 1925.

1,669,192. HOSPITAL APPLIANCE; J. C. Fischer, Wauwatosa, Wis. App. filed June 12, 1926. Distributing cart with food warming equipment.

1,669,193. ELECTRIC EXTENSION PLUG; J. A. Fourney, Oakland, Calif. App. filed Nov. 9, 1922.

1,669,202. PRESSURE-CONTROLLED SWITCH; M. Lassen, Detroit, Mich. App. filed Oct. 17, 1924.

1,669,209. LAMP SOCKET; J. Ribaysen, Chicago, Ill. App. filed April 30, 1925.

1,669,240. ELECTRIC SWITCH; O. Hammerstrom and H. O. Engstrom, Bridgeport, Conn. App. filed July 15, 1924.

1,669,274. ELECTRIC SWITCH; C. E. Anderson, Stratford, Conn. App. filed Oct. 21, 1921. Toggle type.

1,669,283. ELECTRIC SWITCH; J. R. Carlson, Hartford, Conn. App. filed Nov. 10, 1922. Rotary snap switch.

1,669,298. ROTARY TIMING SWITCH; J. Y. Hartman, New Orleans, La. App. filed June 18, 1926.

1,669,318. ELECTRICAL APPLIANCE; C. C. Baad, Bronx, N. Y. App. filed June 19, 1926. A table lamp having a base within which a pair of electrical appliances are normally housed, but which may be moved to an exposed position for use by dropping suitable doors provided in the base.

1,669,334. COIL CASING AND SWITCH THEREFOR; W. Hemingway, Jr., Vicksburg, Miss. App. filed March 1, 1923.

1,669,337. LIVE-LINE CLAMP; G. A. Iler, Youngstown, Ohio. App. filed Sept. 30, 1925.

1,669,372. MULTIPLE-SERIES SWITCH; V. R. Despard, Valparaiso, Ind. App. filed Oct. 16, 1925.

1,669,373. OPERATING MEANS FOR ROTARY SWITCHES; V. R. Despard and H. C. R. Popp, Valparaiso, Ind. App. filed Oct. 16, 1925.

1,669,374. ROTARY SNAP SWITCH; V. R. Despard, Valparaiso, Ind. App. filed April 9, 1926.

1,669,385. METHOD OF PRODUCING ELECTRICAL HEATING ELEMENTS; E. L. Wiegand, Dormont Borough, and A. P. Wiegand, Crafton, Pa. App. filed June 4, 1927.

1,669,386. SAFETY CONTROL DEVICE; W. W. Williams, Bloomington, Ill. App. filed Dec. 12, 1925. For a liquid fuel heating system.

1,669,393. BATTERY SOLUTION; A. Dembowick, Minneapolis, Minn. App. filed Aug. 4, 1926.

1,669,400. IMPEDANCE METER; C. E. Vawter, Philadelphia, Pa. App. filed Aug. 5, 1921.

(Issued May 15, 1928)

Reissue 16,966. SYNCHRONIZING DEVICE; O. C. Traver, Schenectady, N. Y. App. filed July 29, 1922. Automatic.

Reissue 16,967. INDUCTION FURNACE HAVING UNIDIRECTIONAL CIRCULATION; J. R. Wyatt, Camden, N. J. App. filed Aug. 29, 1928.

1,669,409. SHEATH FOR CABLE CONNECTIONS TO ELECTRIC-IRON PLUGS; G. Browning, Wilmette, Ill. App. filed May 6, 1926.

1,669,434. SWITCHING DEVICE; G. Werner, Frankfort-on-the-Main, Germany. App. filed May 17, 1924. For the electrical connection in any desired combination of a plurality of points of electrical operation.

1,669,447. CONDUIT FITTING; J. C. Boyton, Cleveland, and W. H. Doddridge, Lakewood, Ohio. App. filed Jan. 2, 1926.

1,669,453. WIRING SYSTEM FOR TRANSFORMERS FOR MULTIPHASE FURNACES; H. Brock, Knapsack, near Cologne, Germany. App. filed March 15, 1927.

1,669,468. MEDICAL ELECTRICAL APPARATUS; C. Heintze, Chicago, Ill. App. filed Jan. 28, 1926. For electric ray treatment.

1,669,478. LIGHTING FIXTURE; J. G. Lengel, Los Angeles, Calif. App. filed Jan. 24, 1927.

1,669,484. THERAPEUTIC APPARATUS; C. W. Mowry, Portsmouth, R. I. App. filed March 17, 1926.

1,669,493. CIRCUIT BREAKER; J. Slepian, Swissvale, Pa. App. filed Oct. 15, 1923. Air type.

1,669,494. LIGHTNING ARRESTER; J. Slepian, Swissvale, Pa. App. filed April 29, 1924. For direct-current circuits.

1,669,505. REGULATION SYSTEM; L. N. Crichton, Wilkinsburg, Pa. App. filed July 6, 1923. For the transmission of power at high voltages over long distances.

1,669,507. PRIME MOVER AND CLUTCH; J. T. Dickson, Los Angeles, Calif. App. filed Feb. 11, 1927.

1,669,509. ELECTRIC CONTROLLER DEVICE FOR SIGNALS; S. J. Eyrse, Minneapolis, Minn. App. filed Dec. 17, 1924.

# New Trade Literature

INSULATING VARNISH.—The John C. Dolph Company, Newark, N. J., is distributing a solvent and calculating chart for Dolph's insulating varnishes.

CONTROL EQUIPMENT. — Bulletins GEA-19D, GEA-252A and GEA-360B issued by the General Electric Company, Schenectady, N. Y., describe and illustrate respectively its CR7006-D4 and D5 alternating-current inclosed magnetic switches; the type M, multiple unit control system for railway service, and the CR7761-F1 remote-indicating speed controller for slip-ring induction motors. The company also is distributing the following bulletins: GEA-468A, covering drum-type controllers for direct-current adjustable-speed motors; GEA-743A, describing drum controllers for two or three-phase slip-ring induction motors, and GEA-980, covering inclosed speed-regulating rheostats for starting and field control of direct-current motors.

ELECTRIC WATER HEATERS.—The Automatic Electric Heater Company, Philadelphia, has issued bulletin No. 51-28 covering the "Sepco" low wattage, storage type, electric water heaters. A diagram shows the construction of the heater, and operating data are included in the bulletin.

STREET-LIGHTING EQUIPMENT. — "Overhead Street Lighting Equipment" and "Ornamental Street Lighting" are the titles of catalog 218-A and 218-B issued by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. These catalogs give complete information on all street-lighting equipment and accessories manufactured by the company, and also describe and illustrate the equipment with photographs, dimensioned line drawings, charts, and line drawings. New equipment and improvements on former designs are also included.

LIVE LINE MAINTENANCE TOOLS.—Catalog No. 4 issued by the Tip's Tool Company, Inc., 325 East Main Cross Street, Taylorville, Ill., covers a complete set of Tip's tools for live line maintenance. An illustration shows the practical application of the company's No. 11 live line maintenance guard and a drawing shows the method of working double circuit lines. Other illustrations show the method employed in using various tools.

ELECTRIC MOTORS.—Bulletin No. 102 issued by the American Electric Motor Company, Cedarburg, Wis., covers the American two and three-phase induction motors from ½ hp. to 200 hp. The bulletin contains an illustrated general description of the various types, gives the advantages of each and details the methods of manufacture.

SWITCHING EQUIPMENT. — Bulletins GEA-14B, GEA-53B and GEA-931 issued by the General Electric Company, Schenectady, N. Y., describe and illustrate respectively its automatic switching equipment for sectionalizing and reclosing service; busbar clamps and clamp terminals for outdoor switching equipment, and automatic switching equipment for alternating-current railway-signal and train-control feeders. Bulletin GEA-974 issued by the company gives the dimensions of its type FKR-55 oil circuit breakers.

# Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

Purchase is desired in Cape Haitien, Haiti (No. 31,433), of motors and generators.

An agency is desired in Copenhagen, Denmark (No. 31,390), for electric refrigerators.

Purchase and agency are desired in Constantza, Rumania (No. 31,449), for dental X-ray apparatus.

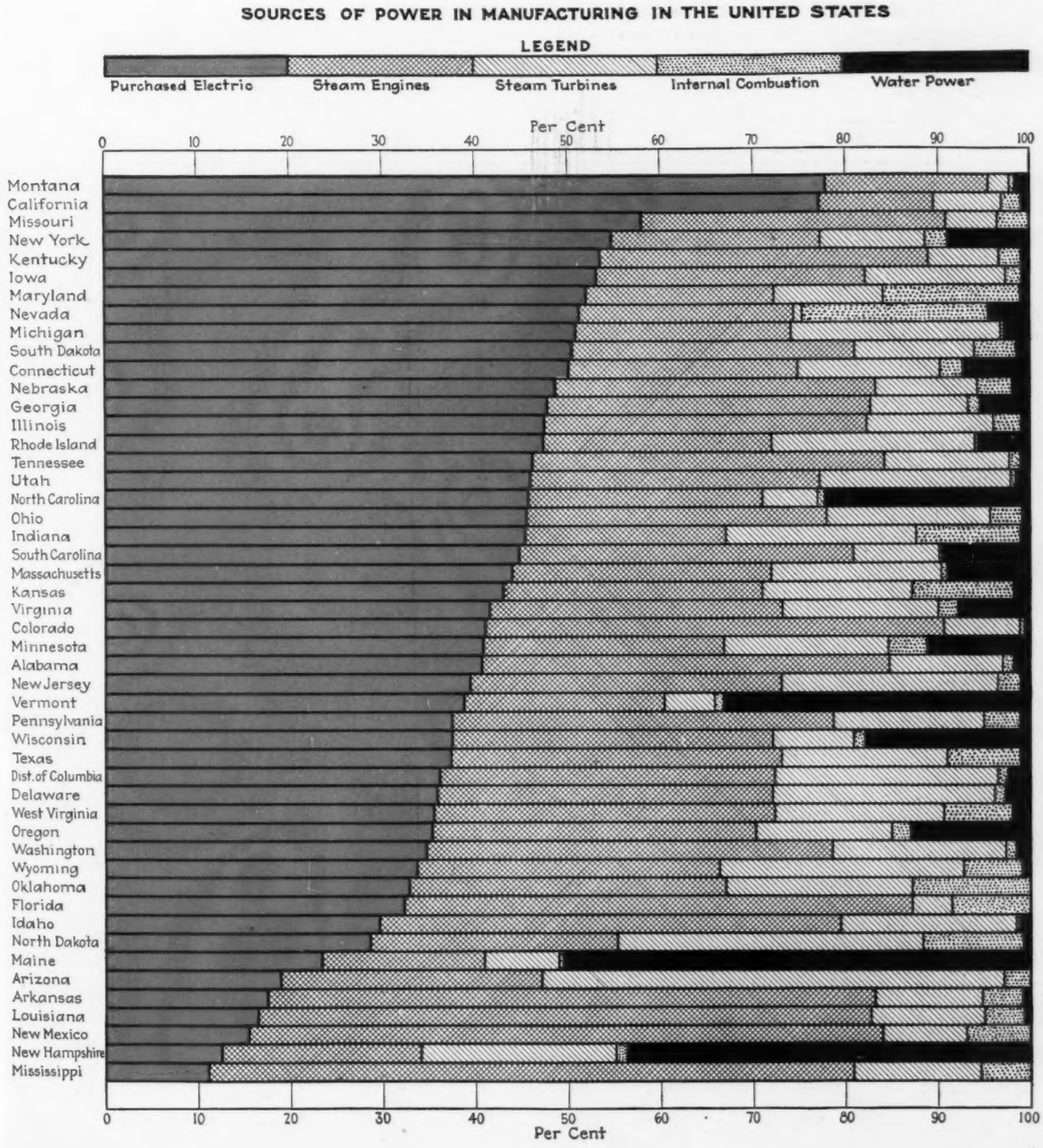
Any manufacturer desiring to establish agencies abroad may consult with the nearest district office of the Bureau of Foreign and Domestic Commerce, Department of Commerce, where data on available agencies throughout the world are on file.

# Business Facts for Electrical Men

Selected Statistics Presented Graphically for the Use of All Interested in Analyzing the Trend of the Electrical Business

## Where Is the Industrial Power Market?

IN MONTANA 78 per cent of the installed horsepower used in manufacturing is comprised in motors operated on purchased electric energy. In Mississippi it is only 11 per cent. The remainder uses steam, internal combustion engines and water power. Electrical operation on energy generated within the establishments is not included. The chart is based on the 1925 census of manufactures.



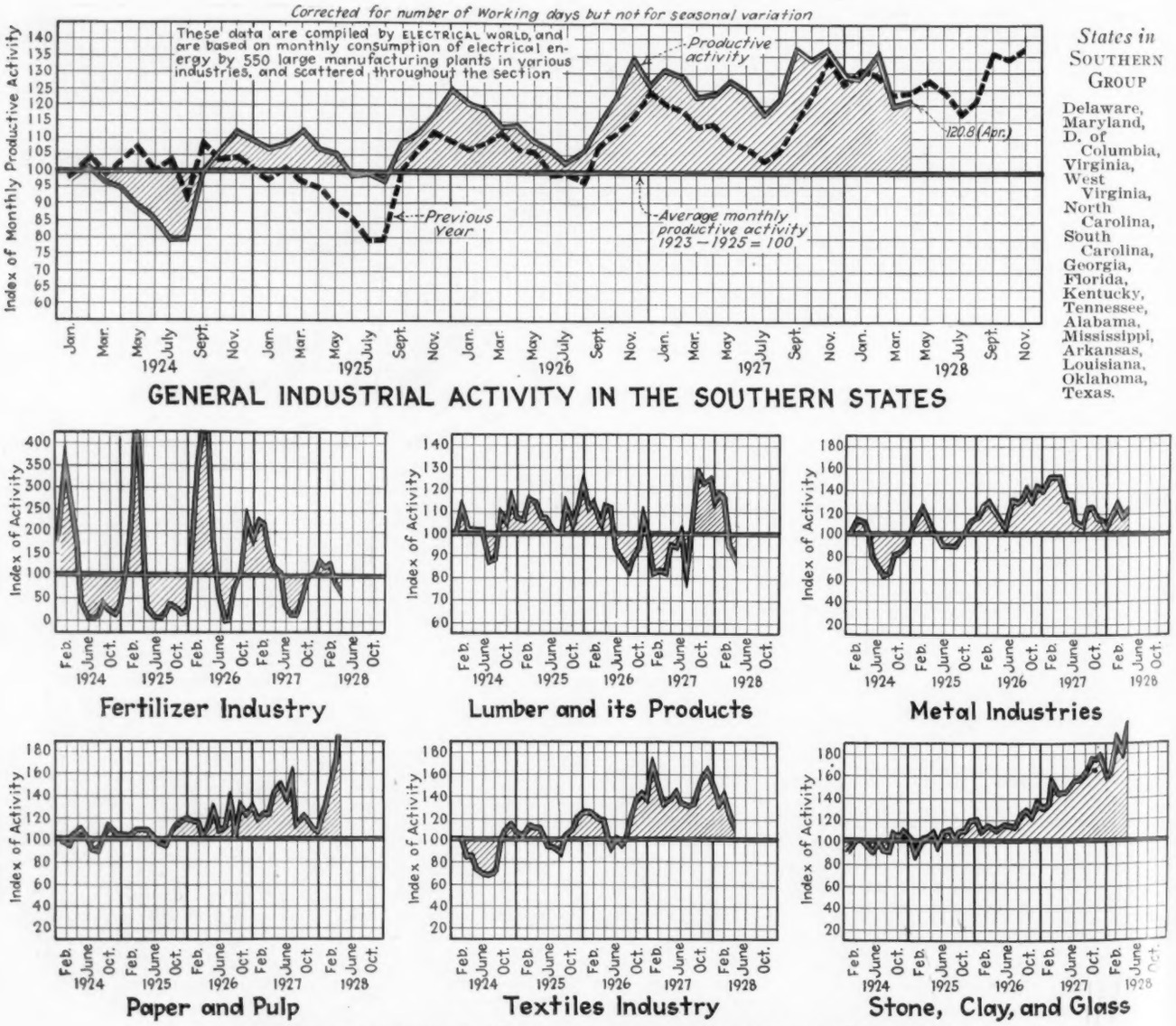
# Southern Operations Slightly Below Those of Last Year

APRIL witnessed a more or less seasonal drop in industrial operations in the Southern States. The April rate of production was 2.7 per cent under March. Past history indicates that such a rate of decreased industrial operation would be expected at this season of the year. The average rate of general production during the first four months of the current year is about 1 per cent under the same period of 1927, a remarkable tribute to the industrial development of the South when it is remembered that the average rate of operation in the textile plants of the South so far this year was 14 per cent under the same period last year. General industry in the nation as a whole reported an April activity of 0.9 per cent above March and about 2.2 per cent above April last year. The textile and paper and pulp industrial groups were the only two reporting April operations under those of last year.

*Index of Productive Activity in the Southern States*
Average Monthly 1923–25=100
All Figures Adjusted for Number of Working Days

| | April, 1928 | March, 1928 | April, 1927 | Average First Four Months, 1928 | Average First Four Months, 1927 |
|---|---|---|---|---|---|
| All industry | 120.8 | 118.8 | 123.1 | 125.1 | 126.6 |
| Metal industries group | 121.7 | 116.1 | 130.8 | 121.8 | 146.0 |
| Rolling mills and steel plants | 124.7 | 136.7 | 130.8 | 136.2 | 146.0 |
| Metal-working plants | 113.4 | 100.6 | ..... | 107.3 | ..... |
| Food and kindred products | 114.4 | 106.8 | 115.2 | 118.8 | ..... |
| Stone, clay and glass | 205.7 | 178.0 | 141.0 | 185.8 | 142.3 |
| Textiles | 112.0 | 123.6 | 137.8 | 128.3 | 147.2 |
| Paper and pulp | 201.0 | 176.3 | 143.2 | 164.9 | 128.6 |
| Lumber and its products | 88.3 | 95.3 | 95.7 | 105.0 | 86.5 |
| Fertilizer industry | 68.7 | 91.1 | 125.0 | 101.2 | 106.0 |
| All industry (United States) | 119.3 | 118.2 | 116.9 | 120.9 | 116.5 |

ELECTRICAL WORLD *Barometer of Industrial Activity in the Southern States*


Corrected for number of Working days but not for seasonal variation
These data are compiled by ELECTRICAL WORLD, and are based on monthly consumption of electrical energy by 550 large manufacturing plants in various industries, and scattered throughout the section
Productive activity
120.8 (Apr.)
Previous Year
Average monthly productive activity 1923—1925 = 100
Index of Monthly Productive Activity
States in SOUTHERN GROUP
Delaware, Maryland, D. of Columbia, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Kentucky, Tennessee, Alabama, Mississippi, Arkansas, Louisiana, Oklahoma, Texas.
GENERAL INDUSTRIAL ACTIVITY IN THE SOUTHERN STATES
Index of Activity
Fertilizer Industry
Lumber and its Products
Metal Industries
Paper and Pulp
Textiles Industry
Stone, Clay, and Glass
PRODUCTIVE ACTIVITY IN THE PRIMARY INDUSTRIES OF THE SOUTHERN STATES